



A systematic review of local vulnerability to climate change: In search of transparency, coherence and comparability

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Introduction

This document reports on a systematic review which was done as part of a project called "Coping with Climate Change: What is vulnerability and how should it be researched?". The purpose of this report is to provide an archival record of the systematic review method that was used in the research.

Background

This research was commissioned by the International Livestock Research Institute (ILRI) and feeds into their CCAFS programme. The CCAFS programme is to be implemented and will seek to improve the conditions of those who are considered vulnerable to the effects of climate change. In order to draw conclusions about the impacts of their programme, a well-designed evaluation study will be required. This systematic review was commissioned as an input into the design of such a study. The review looked at studies of 'vulnerability' in order to generate an operationalizable research framework based on the best quality methods in the source literature.

The review had as a research question (RQ):

- How is vulnerability defined
- How is vulnerability operationalized
- Which operationalizations are empirically valid
- Which definitions do sound operationalizations support

As can be seen from the RQs, this review is concerned with reviewing methods rather than data or conclusions. It takes as its central focus an object of research, in this case *vulnerability*. An object of research is researched through a theoretical framework and a methodology. A 'theoretical framework' can be deconstructed into three components: constructs¹; construct definitions; and relationships (Carroll, Booth, et al. 2013; Morse 2004). Of these three components, we use a definition of a *construct* as a conceptual representation of a phenomenon. A construct can itself be deconstructed into a set of *sub-constructs* or can be abstracted as higher-order construct, or possibly as a theory (Morse 2004). We take a *construct definition* as a delineation of what phenomena the construct represents, a delineation which must be bounded such that a reader can determine what does and what does not count as an example of that construct (Morse 2004). Note that constructs can be defined either conceptually (what real world phenomena does the construct represent) or operationally (what data will be used to empirically represent the construct (Morse 2004). However, this level of resolution is not carried explicitly forward in the analysis as to do so would risk that our theoretical framework would not fit our subject articles which may not adhere to such a level of resolution. We use *construct relationships* as elements of a theoretical framework which are used to link constructs together in such a way as to shape the framework.

Of these three sub-components of a theoretical framework, analytically the most important for our purposes is that of the *construct*, as it functions as an organizing unit of analysis, which form the basis of conceptual frameworks and which are themselves operationalized and thus form the link between conceptual frameworks and research methods.

Another important component of our RQ is that of *operationalization*. An 'operationalization' of a construct is used to describe any step in which a researcher moves a theoretical concept towards an actual act of gathering data to measure or represent that concept. The term operationalization in this paper is used to describe both intermediary steps of conceptual deconstruction, and the final instrumentation. Finally, we consider an

¹ For general purposes, throughout this document the terms 'construct', 'concept' and 'construction' are used interchangeably, although the use of the term 'construct' is preferred.

operationalization to be *valid* if the empirical data used to represent the construct also represents the phenomenon represented by the construct (Kampen and Tamás 2014).

Methods

The methods used to conduct this review can be organised into six broad stages:

- 1. Selection of literature
- 2. Identification of constructs, frameworks and operationalizations
- 3. Synthesis of frameworks and constructs
- 4. Transparency assessment of operationalized constructs.
- 5. Validity and feasibility assessment of operationalized constructs
- 6. Integration of candidate operationalizations into ideal-type frameworks

Selection of literature

This review was commissioned by ILRI for the CCAFS programme. A similar systematic review, but with different research questions, was also commissioned one year previously. The literature selection for the first review was also brought forward and added to in the second review. Therefore this section reports on two distinct stages of selection of literature.

Selection of literature: First review

A search was carried out across 15 scientific databases (AJOL; AGRICOLA; AGRIS; Ingenta Connect; JSTOR; Mendeley; Scholar (Google); Science Direct; Scopus; SSRN (social science research network); Springer ; ink; Web of Knowledge; Web of science; Scopus; Ebscohost). A separate search string was composed for each database reflecting the particular characteristics of that database. Search strings were based on a common set of terms which were derived from the central research question of that review², and then adapted to the specific databases. The common set of terms is listed as follows:

- Poverty and vulnerability to climate risk
- Rural livelihoods and vulnerability
- Food insecurity and climate risk
- Climate variability and household vulnerability [and community]
- Causes of vulnerability
- Agriculture and climate change and vulnerability outcome
- Agriculture and food security and climate change
- Vulnerability and household agriculture
- Food insecurity and household poverty
- Climate hazards and vulnerability
- Searched using vulnerability and secondly with assessment:
- Climate risk and vulnerability [assessment]
- Climate change and vulnerability [assessment]
- Food insecurity and vulnerability [assessment]
- Poverty and vulnerability [assessment]
- Climate and floods and vulnerability assessment]
- Households and vulnerability [assessment]
- Climate and drought and vulnerability [assessment]
- Vulnerability status and climate impact

² The Research Question of the first review is as follows:

^{1.} What determinants of vulnerability are common across the studies?

^{2.} What are the causal mechanisms that link determinants and vulnerability outcomes?

^{3.} What are the methodological approaches that give most robust and reliable results in understanding determinants and mechanisms of vulnerability?

- Gender and climate change and vulnerability
- Household level vulnerability to climate change
- Poverty and vulnerability
- Climate risk assessments [and households / communities]
- Climate change vulnerability and hazard exposure
- Climate change risks and household characteristics
- Sensitivity and climate change risk and vulnerability status
- Droughts and household food security and vulnerability
- Floods and household food security and vulnerability
- Climate risk [and hazard] and food security
- Vulnerability determinants and climate change
- Institutions and vulnerability outcomes
- Determinants of [household] vulnerability
- Local level vulnerability assessment climate change
- Household vulnerability and climate change case studies

This search of databases returned 168 papers. Initial screening for relevance was conducted on titles and abstracts of these articles. This screening was based on the PICOTT framework and the eligibility criteria derived from this framework are summarized in the list below:

- Rural livelihoods and households
- Sub-national unit of analysis
- Poverty
- Food insecurity
- Agriculture
- Climate change
- Climate risk
- Climate variability (includes drought and floods)
- Multiple stressors including a climate-related risk

Initial screening reduced the pool of articles to 71. These 71 articles were brought forward for a full text review. This second stage of relevance and quality screening was based on the following criteria:

- Located in the global tropics
- Local level focus of assessment
- Clear research question
- Well-articulated sampling process and data collection methods
- Methodology that used empirical data (primary or secondary)
- Description of data analysis
- Analysis section went beyond simple description of determinants and attempted to unpack the causality of vulnerability
- Findings and analysis were focused on vulnerability outcomes and determinants specifically, in line with our key research question and aims, rather than topical areas such as adaptive capacity, resilience or coping mechanisms
- Draws conclusions about vulnerability determinants

The results of this second stage of screening are summarized in the table in Appendix A. 29 papers were considered to be relevant and of sufficient quality to be included in the study. These papers then constituted the subject literature for the first review. Further methods of the first review will not be detailed here as the primary focus of this report is the methods used to conduct the second review. 28 of these 29 articles were subsequently sent to the research team working on the second review and constituted the initial pool of articles.

Selection of literature: Second review

28 articles were given by the team working on the first review to the team working on the second review. As this set of literature was gathered initially for related by distinct purposes, the team conducted a second stage of literature gathering based on consultation of experts in the field (as do (Sandoval et al. 2012)). Expert selection was to be guided by the principles of purposeful and theoretical sampling, whereby the goal was to capture at least one article from all relevant approaches. That is, this review would be more analogous to grounded theory than to and RCT study, with the implication that sampling is guided by 'theoretical sampling'. What was required theoretically was one example, preferably the best example, of each framework used for the study of vulnerability. It was therefore first necessary to identify and map what approaches are present in the initial pool of 28 articles.

Initial analysis began with reading an article and drawing diagrams of the theoretical framework used in that paper. I proceeded to do this with all 28 articles³, using some of the techniques of the constant comparative method (Glaser 1965). It is important to note that this was an unstructured exercise, so the method wasn't followed strictly.

	Category	Definition ⁴	Values
1.	Data type	What type of data is used to	metric;
		conduct analysis and draw	indicator;
		conclusions?	interpretive;
			other
2.	Dimensions of vulnerability	How is vulnerability defined and	IPCC;
		what aspects of the concept is	VEP;
		the article interested in? This is	Food Insecurity;
		categorised into 6 prevalent	Sustainable Livelihoods;
		approaches based on recognised	Resilience;
		frameworks or adaptations of	Other
		those frameworks.	
3.	Determinants of vulnerability	What independent variables is	n/a⁵
		the paper interested in	
		investigating. What do they see	
		as the important factors that	
		influence vulnerability	
4.	Scale	This variable is concerned with	household;
		the level at which data is	household-local;
		collected and conclusions are	local-regional;
		derived. At lowest level,	continental/global
		household data is used to	
		conclude about those	
		households. At the next step up,	
		household data from one or	
		more localities is used to draw	

At some point, four significant categories of difference were identified as emergent. These were:

³ In the following order: (Günther and Harttgen 2009); (Bogale, Taeb, and Endo 2006); (Mubaya et al. 2012); (Chhihn and Poch 2012); (Tesso, Emana, and Ketema 2012); (Dhamija and Bhide 2011); (Antwi-Agyei et al. 2013); (Piya, Maharjan, and Joshi 2012); (Deressa, Hassan, and Ringler 2009); (Misselhorn 2005); (Hahn, Riederer, and Foster 2009); (Eakin, Winkels, and Sendzimir 2009); (Échevin 2011); (Sarris and Karfakis 2010); (Acosta et al. 2013); (Dasgupta and Baschieri 2010); (Sallu, Twyman, and Stringer 2010); (Luers et al. 2003); (Westerhoff and Smit 2009); (Nkondze, Masuku, and Manyatsi 2013); (Sietz, Choque, and Lüdeke 2012); (Capaldo et al. 2010); (Mutsvangwa 2011); (Mengistu 2011); (Gandure, Walker, and Botha 2013); (Jamir et al. 2013); (Calvo and Dercon 2013); (Notenbaert et al. 2013); (Khan and Salman 2012)

 $^{^{5}}$ It did not prove to be feasible to categorise determinants due to the wide variety.

conclusions about households and about the specific	
characteristics of the	
localit(y/ies)	

Initially these were loose categories, with open-ended values. As comparison continued, I came to settle on a discrete set of values for each category with the exception of 'determinants'. The wide variety of determinants used in the articles meant that it was not really possible to create a small number of discrete values, while a large number would defeat the purpose of clustering. This category was mostly dropped in the clustering exercise that followed.

When diagrams had been drawn for all 28 articles, the notes were revised in order to give values on each of these three remaining categories of difference.

Next, I turned towards creating clusters based on these 3 remaining categories. The most significant difference was that between metric and indicator data (the majority of articles) on the one hand and interpretive data on the other. This category functions like a decision tree then. Within the 'more quantitative^{6'} articles, I constructed a table tabulating 'dimensions' with 'scale'. This proved reasonably nice for clustering, but with the caveat that 'scale' seemed to be partly correlated with 'data-type'. As it turned out, almost all the quantitative studies dealt with the household or household-local level, making this category semi-redundant. This was to be partly expected as the search strategy from the first review specifically targeted studies at a local level. However, an exclusive focus on the local was not apparent on initial exploratory reading (hence the creation of additional values), and furthermore, the distinction between household and local/community scales was not uniform.

With this table, 11 clusters were created in a structured fashion.

Two additional 'residual' clusters were created: first those articles using interpretive data. Second, those quantitative articles that use frameworks that don't fit into the prevalent frameworks. This cluster set is represented in the table that follows:

Quantitative a	Quantitative approaches.				
	IPCC and adaptations	VEP and adaptations	Food InSecurity	Sustainable livelihoods (SLA) and adaptations	Resilience
Household	Luers et al 2003 ; Tesso et al 2012; Westerhoff & Smit 2009	Bogale et al 2006; Sarris & Karfakis 2006	Capaldo et al 2010; Sietz et al 2012	sallu et al 2010	sallu et al 2010 ; Tesso et al 2012
Household – Local	Antwi-Agyei et al 2013; Hahn et al 2009; Jamir et al 2013; Piya et al 2012;	Chhinh & poch 2012; Deressa et al 2009; Echevin 2011; (gunther &	Misselhorn 2005; Mutsvangwa 2011	Antwi-Agyei et al 2013; Eakin_etal_2008 ; Hahn et al 2009; Piya et al 2012;	Antwi-Agyei et al 2013

⁶ Quantitative-qualitative is an insufficient distinction. Instead an imperfect 'quantitative-interpretive' distinction is used. This distinguishes between on the one hand, approaches that seek to generate quantitative or structured categorical conclusions, eventhough many of them collect qualitative data in the process; and those whose goal is to build theory on vulnerability based on interpretive research with people exeriencing or at risk of vulnerability.

		herttgen 2009);			
		Mutsvangwa 2011;			
		Nkondze et al			
		2013			
Continental				Eakin_etal_2008	
/ Global					
NOTE ON FR	AMEWORKS:				
-		-		of vulnerability are vi	
				based on three facto	rs – exposure to
	nge, sensitivity to cha		-		
	se derived from Vuln stiaensen & Subbara		Poverty (VEP) as de	eveloped by Chaudhu	iri et al (2002);
	d insecurity;	0 (2003),			
	-	m the Sustainable Li	velihoods Approach	(SLA) as developed b	ov DFID (1999):
	(2000); Scoones (19			(
- and	those that look at Re	esilience.			
Interpretive	approaches				
Gandure et a					
	ceptions of climate cl	hanges; risks; and ac	laptation strategies		
Mengistu 20					al
- Per (Mubaya et a		lange; vuinerable gr	oups; and coping sti	rategies at village lev	ei
	ceptions of threats to	livelihoods at house	ehold – local scale		
Notenbaert	•				
	 Looks at Adaptive Capacity from IPCC framework through interpretive lens at household and village 				
level.					
Miscellaneou	is approaches				
Calvo & Dero					
		uncertainty regardir	ng future poverty (di	istinct from VEP) at h	ousehold and
	aggregate (village) level.				
Dasgupta and baschier 2010					
 Vulnerability is viewed in terms of "asset vulnerability index". This could be seen as an adaptation of VEP but seems sufficiently extended to warrant not being grouped with the others. 					
dhamija & b		., extended to warn			
 Looks at determinants of both the incidence and transitory-ness of poverty, but does not relate this to 					
climate change. (Not relevant?)					
	Khan & Salman 2012				
- Examines vulnerability through a framework they develop called the 'Human Vulnerability Index',					
	(indices; population density, lack of knowledge, lack of decent housing, lack of decent standard of living, livestock household and farm households) which is used to look at variability in district-level				
(ind					
(ind livir		ld and farm househo			

An email was composed and sent to a number of hand-chosen experts. The text of the email body and the accompanying attachment can be seen in Appendix B. Respondents were asked to look at our categorization of framework approaches to *Vulnerability* and asked two questions. First they were asked if there were additional models/frameworks that should be included in the review, and if so asked to suggest an article as an example

of that framework. Secondly they were asked if there were articles which are stronger representatives of the seven frameworks we had identified.

3 replies containing a total of 8 suggested articles were received prior to our deadline, with one further response coming after we had moved on to the next stage of the review. This brought our pool of articles up to 36. During analysis, one article (Dhamija and Bhide 2011) which was received from the first review was suspected by one member of the team to be irrelevant. Another member of the team examined this article and a decision was made to exclude it⁷. Thus the total number of articles in the review was 35. Details of this set are indexed in the table below.

Reference	Title	Included through
(Antwi-Agyei et al. 2013)	Characterising the nature of household vulnerability to climate variability: empirical evidence from two regions of Ghana	Literature search in first review
(Baca et al. 2014)	An Integrated Framework for Assessing Vulnerability to Climate Change and Developing Adaptation Strategies for Coffee Growing Families in Mesoamerica	Recommended by respondents
(Berkes and Ross 2013)	Community Resilience: Toward an Integrated Approach	Recommended by respondents
(Bogale, Taeb, and Endo 2006)	Land ownership and conflicts over the use of resources: Implication for household vulnerability in eastern Ethiopia	Literature search in first review
(Calvo and Dercon 2013)	Vulnerability to individual and aggregate poverty	Literature search in first review
(Capaldo et al. 2010)	A model of vulnerability to food insecurity	Literature search in first review
(CARE 2009)	Climate Vulnerability and Capacity Analysis: Handbook	Recommended by respondents
(Chhihn and Poch 2012)	Climate Change Impacts on Agriculture and Vulnerability as Expected Poverty of Kampong Speu Province, Cambodia	Literature search in first review
(Dasgupta and Baschieri 2010)	Vulnerability to Climate Change in rural Ghana: Mainstreaming climate change in poverty- reduction strategies	Literature search in first review
(Deressa, Hassan, and Ringler 2009)	Assessing Household Vulnerability To Climate Change: The Case Of Farmers In The Nile Basin Of Ethiopia	Literature search in first review
(Eakin, Winkels, and Sendzimir 2009)	Nested vulnerability: exploring cross-scale linkages and vulnerability teleconnections in Mexican and Vietnamese coffee systems	Literature search in first review
(Eakin et al. 2012)	Livelihoods and landscapes at the threshold of change: disaster and resilience in a Chiapas coffee community	Recommended by respondents
(Échevin 2011)	Characterizing poverty and vulnerability in rural Haiti: a multilevel decomposition approach	Literature search in first review
(Ford and Smit 2004)	A Framework for Assessing the Vulnerability of Communities in the Canadian Arctic to Risks Associated with Climate Change	Recommended by respondents
(Füssel and Klein 2006)	Climate change vulnerability Assessments: An evolution of conceptual thinking	Recommended by respondents
(Gandure, Walker, and	Farmers' perceptions of adaptation to climate	Literature search in

⁷ This decision was based on the article focussing on the determinants of transitions in and out of poverty, but these determinants could not be linked to climate change.

Botha 2013)	change and water stress in a South African rural community	first review
(Günther and Harttgen	Estimating Households Vulnerability to	Literature search in
2009)	Idiosyncratic and Covariate Shocks: A Novel	first review
	Method Applied in Madagascar	
(Hahn, Riederer, and	The Livelihood Vulnerability Index: A pragmatic	Literature search in
Foster 2009)	approach to assessing risks from climate	first review
	variability and change—A case study in	
	Mozambique	
(Ionesco et al. 2009)	Towards a Formal Framework of Vulnerability to	Recommended by
(10112300 et al. 2003)	Climate Change	respondents
(lamir at al. 2012)	Farmers' vulnerability to climate variability in	Literature search in
(Jamir et al. 2013)		
	Dimapur district of Nagaland, India	first review
(Khan and Salman 2012)	A simple human vulnerability index to climate	Literature search in
	change hazards for Pakistan	first review
(Luers et al. 2003)	A method for quantifying vulnerability, applied to	Literature search in
	the agricultural system of the Yaqui Valley,	first review
	Mexico	
(Marshall 2010)	Understanding social resilience to climate	Recommended by
	variability in primary enterprises and industries	respondents
(Mengistu 2011)	Farmers' perception and knowledge of climate	Literature search in
	change and their coping strategies to the related	first review
	hazards: Case study from Adiha, central Tigray,	
	Ethiopia	
(Misselhorn 2005)	What drives food insecurity in southern Africa? a	Literature search in
(101336110111 2003)	meta-analysis of household economy studies	first review
(N4) have at al. 2012)		
(Mubaya et al. 2012)	Climate variability and change or multiple	Literature search in
	stressors? Farmer perceptions regarding threats	first review
(to livelihoods in Zimbabwe and Zambia	
(Mutsvangwa 2011)	Climate Change and Vulnerability to Food	Literature search in
	Insecurity among Smallholder Farmers: A Case	first review
	Study of Gweru and Lupane Districts in Zimbabwe	
(Nkondze, Masuku, and	Factors Affecting Households Vulnerability to	Literature search in
Manyatsi 2013)	Climate Change in Swaziland: A Case of	first review
	Mpolonjeni Area Development Programme (ADP)	
(Notenbaert et al. 2013)	Derivation of a household-level vulnerability	Literature search in
	index for empirically testing measures of adaptive	first review
	capacity and vulnerability	
(Piya, Maharjan, and Joshi	Vulnerability of rural households to climate	Literature search in
2012)	change and extremes: Analysis of Chepang	first review
- ,	households in the Mid-Hills of Nepal	
(Sallu, Twyman, and	Resilient or Vulnerable Livelihoods? Assessing	Literature search in
Stringer 2010)	Livelihood Dynamics and Trajectories in Rural	first review
Stringer 2010)	Botswana	mstreview
(Sarris and Karfakis 2010)	Vulnerability to Covariate and Idiosyncratic	Literature search in
(Jamis and Kanakis ZULU)	Shocks and Safety Net Targeting of Rural	first review
		IIISLIEVIEW
	Households with an Application to Rural Tanzania	
(Sietz, Choque, and	Typical patterns of smallholder vulnerability to	Literature search in
Lüdeke 2012)	weather extremes with regard to food security in	first review
	the Peruvian Altiplano	
(Tesso, Emana, and	Analysis of vulnerability and resilience to climate	Literature search in
Ketema 2012)	change induced shocks in North Shewa, Ethiopia	first review
(Westerhoff and Smit	The rains are disappointing us: dynamic	Literature search in
2009)	vulnerability and adaptation to multiple stressors	first review
	in the Afram Plains, Ghana	

Identification of constructs, frameworks and operationalizations

The nest stage was data extraction, specifically the identification of theoretical frameworks, constructs, and operationalizations used in the papers. The 35 articles were imported into NVivo and a coding protocol was designed that would allow the 35 articles to be coded evenly and transparently, and to extract data in a standardised format.

A set of instructions for this step was drawn up and pilot tested by two members of the research team (Aogán Delaney and Peter Tamás) on two articles (Mengistu 2011; Notenbaert et al. 2013). This inter-rater test was not designed as a 'hard' test with pre-defined divergence thresholds. Instead we used it as a means to spot differences in interpretation of the instructions which we then discussed in order to reach agreement on interpretation and to clarify ambiguities. Additionally a number of mechanical inefficiencies were spotted during the inter-rater test and the instructions were revised accordingly. What follows in this report recounts the execution of the revised instructions.

The revised instructions are reproduced below, with footnotes used to clarify interpretations, followed by a description of the methodological contribution of the step.

- 1.1 Read the abstract, introduction, and theoretical framework sections until a Research Question⁸ is identified. Apply the node 'Research question' to the segment of text.
- 1.2 Under the node 'Article-specific constructs' create a sub-node of the form '[author] ([year])'. Within the research question, identify all constructs and for each, create a new node under the node '[author] ([year])' and apply it to the text where the construct appears. Re-read the theoretical framework and identify all additional constructs that in some way relate to those initially identified in the research question. Using the same technique, create new sub-nodes for each new construct identified.
- 1.3 Create a new word document with the title 'article-specific constructs'. For each article, paste a table of the form below into the document. Once coding for constructs is complete, for each article make a list in the first column of all concepts/constructs (output 1.a) that have been identified and for which nodes have been created.
- 1.4 For each construct, return to the paper and identify a definition for that construct. As a sub-node of the construct node, create a node called 'definition' and apply to that segment of text defining the construct. Where a definition for a construct is not given in the paper, under the construct node create and apply the sub-node 'construct not defined' to the part of the text where the construct was introduced⁹. In cases where no definition is given in the article, but where it is stated that further information is available from the authors, or where it is stated that constructs or models are adapted from another publication, create and apply the sub-node 'definition' to that segment of text where it is specified that further information is available. In the article-specific table, for each well-defined construct, fill in 'yes' in the appropriate cell and add a definition (or further information to be retrieved) in the adjoining cell. For all those constructs without a definition, fill in 'no' in the appropriate cell (output 1.a).
- 1.5 Return to the article and begin to read the abstract, introduction, theoretical framework, and methods sections. Whenever a relationship between constructs is specified or hypothesised, create a node relationship¹⁰ between the appropriate construct nodes, using the most appropriate relationship type out

¹⁰ For certain papers, it may be that the number of constructs makes this strategy too cumbursome. The reviewer may decide to use a different strategy to achieve the same result (although this will also entail an adaptation of 1.7): "Return to the article and begin to read the abstract, introduction, theoretical framework, and methods sections. Whenever a relationship between constructs is specified, apply the codes 'horizontally grouped', 'vertically composed', and/or 'associated or causal relationship'. Every time a piece of text is coded create a new annotation with the format: "horizontal: [list of all construct in this relationship]", "vertical: [list of

⁸ In some cases, the paper is not concerned with executing research based on a framework, but rather seeks to generate a framework. In such cases, the RQ that would be operationalized through the resulting framework is what should be coded. And 'analytically relevant' constructs are to be derived from that.

⁹ The coder may omit creating and applying codes for constructs not defined. As long as the assessments are recorded in the article-specific construct table, then silence in NVivo can suffice.

of associated-causal; vertical; or horizontal. Where a construct is deconstructed into two or more subconstructs, create a new node relationship between the parent construct and each sub-construct. When two or more constructs form a horizontal group, create a separate node relationship linking each construct with all other constructs in the group (output 1.b)

- 1.6 Create a new node called "Emic Research Frameworks" and five sub-nodes called "IPCC", "VEP", "Food Insecurity", "Livelihoods Approach", and "Other framework". Return to the article and begin to read the abstract, introduction, theoretical framework, and methods sections. Locate a segment of text where it best articulates the theoretical framework used in the article and apply the most appropriate sub-node or sub-nodes.
- 1.7 Using the 'create model' function in NVivo, create a new model with the title 'Graphic Summary [author year]'¹¹. Using the 'add project items' function, add all construct nodes under the appropriate sub-node under 'emic constructs', ensuring that 'automatically select descendant nodes' is unchecked; when prompted about selected associated data, ensure 'relationships' is checked. Again using 'add project items' add the appropriate Emic research framework node as an item, and the source as an item, ensuring all associated data is unchecked. Situate items to create a graphic representation of the theoretical framework used in the paper. Export this model as a picture (Output 1.c).
- 1.8 Consult the list of well-defined constructs. For each construct on that list, return to the paper and identify if and where that construct is operationalized. In cases where an operationalization can be located, create as a sub-node of the construct node the node ' 'operationalized' and apply to that segment of text defining how the construct is operationalized, fill in 'yes' in the appropriate cell in the article specific construct table, and copy the relevant text to the adjoining cell. Where a description of operationalization for a construct is not given in the paper, proceed to the next construct. When you have reached the end of the list, consult the list of node-relationships. Return to your list of constructs and for each construct not coded by 'operationalized', check to see if it has been operationalized through a sub- or higher order- or determining construct. Where the construct has been operationalized through another construct create the node 'operationalized through other' as a sub-node of the construct code, and apply to the segment of text coded at the node relationship, add the name of the mediating construct to the appropriate cell in the article-specific construct table and paste the coded text into the adjoining cell. Continue through until the end of the list of constructs. If a node of the form 'operationalized through other' has been applied during the course of the list, return and repeat. When the list is run-through without identifying any more operationalizations, for each remaining construct, locate any appearance in the article, create and apply the sub-node 'not operationalized' and fill in 'not operationalized' in the appropriate cell in the articlespecific construct table (output 1.a)
- 1.9 Repeat Steps 1.1 1.8 for each article.

This coding framework was designed based on the first two research sub-questions of the review ("how is vulnerability defined" and "how is vulnerability operationalised"). At the conceptual level, a 'theoretical framework' can be deconstructed into three components: constructs¹²; construct definitions; and

all higher order constructs] [list of all lower order constructs]", or "associated/causal: [list of all construct in this relationship]"."

¹¹ If the coder has coded for relationships using annotations rather than node relationships, then the instructions for this step are: "Using the 'create model' function in NVivo, for each construct on the list create a box and label with the name of the construct. Situate boxes into groups based on the relationships between models to create a graphic representation of the theoretical framework used in the paper. Using the 'add project items' function, add the current paper, and the appropriate Emic research framework codes, as items in the model. Export this model as a picture"

¹² For general purposes, throughout this document the terms 'construct', 'concept' and 'construction' are used interchangeably, although the use of the term 'construct' is preferred.

relationships; following Carroll, Booth et al (2013) and Morse (2004). Within these three components, 'relationships' can be further deconstructed into three classifications: horizontal, vertical; and associative/causal. These 6 components make the basis of the theory-coding framework.

However, consistent with previous systematic review studies (Carroll, Booth, et al. 2013; Carroll, Rick, et al. 2013), and methodologists (Morse 2004), of these 6 components, the 'construct' is the most significant in terms of the foundations of a theoretical framework. Therefore the coding framework begins by identifying constructs. In order to code only analytically-relevant constructs (and not each and every construct mentioned in discussing theoretical approaches), the coder first identifies a Research Question, and from there, constructs contained in the Research Question, or constructs that relate to those constructs, are identified.

The design is careful to maintain the article-specificity of constructs identified in this way. Rather than create a global set of nodes which can be applied to recurring constructs, the coding framework instead creates a new node for each construct in each article. As such, these constructs are referred to as *emic constructs*. In later stages of the methodology, a set of *etic* or analyst-defined constructs are generated from this set of *emic* constructs.

For each article, a table was created of article-specific constructs, their definitions, if provided, and if applicable the operationalization of these constructs. A standard template was created for these tables to ensure even treatment across articles. The completed tables are included in Appendix C.

Relations between these constructs were then identified and coded. Construct relations are important due to their role in the composition of theoretical frameworks. They are used later in this review as a means of integrating operationalizations of sub-constructs into theoretical frameworks that are defined at a higher level of abstraction. Coding them at an early stage is a means of increasing the transparency around the selection of operationalizations from different papers.

The following step involved coding articles for their theoretical framework. Unlike other codes performed in this stage, this code was not used in a decisive way. A set of 5 framework nodes were created, based on the types of theoretical frameworks identified in the initial exploration of the literature prior to consulting experts for their views. Although it would be preferable to identify theoretical frameworks in an entirely bottom-up manner, this seemed impossible in this context. It was observed prior to commencing the review (and confirmed during the review) that there was a high level of inconsistency with use of terminology in this field. Therefore, using author-reported constructs as a basis of identifying theoretical frameworks through emergent clusters of constructs was considered to be too messy a strategy. Instead, we used 4 *a priori* identified nodes to code for author-identified theoretical frameworks. The four framework categories (plus a miscellaneous category) and instructions on how to recognise them, are given in the table below. These categories were not taken as a final word however, but rather as an instrument to organise the literature. In later stages, the coding and the categories themselves, were subject to interrogation and amended.

Code	Refers to	Possible indicators
IPCC	The framework used by the Intergovernmental Panel on Climate Change (IPCC), which views 'vulnerability' as composed of three elements: 'exposure to climate change-induced stress'; 'sensitivity to climate change- induced stress'; and 'adaptive capacity'	 The theoretical framework contains the three elements of 'exposure', 'sensitivity', and 'adaptive capacity'. The authors report that they build their framework with reference to any publications from the IPCC
VEP	This framework, called 'Vulnerability as Expected Poverty" conceives of 'vulnerability' as the	 The theoretical framework contains the construct 'poverty', 'probability', and 'risk'. The authors report that they use a framework based on the

		1	
	probability that research units will be below a given poverty threshold given certain risk factors associated with climate change.	-	"Vulnerability as Expected Poverty" approach. The authors report that they build their framework with reference to any of the following publications: Chaudhuri, S. 2003. Assessing vulnerability to poverty: concepts, empirical methods and illustrative example http://info.worldbank.org/etools/docs/library/97185/Keny 0304/Ke 0304/vulnerabilityassessment.pdf. Chaudhuri S., Jalan, J. and Suryahadi, A. (2002) Assessing household vulnerability to poverty from cross-sectional data: a methodology and estimates from Indonesia. Discussion Paper 0102-02, Department of Economics, Columbia University Christiaensen, L., and Subbarao, K. (2005) Towards an understanding of vulnerability in rural Kenya. <i>Journal of</i> <i>African Economies</i> , 14(4), 520-558.
Food Insecurit Y	This code refers to frameworks where vulnerability is conceived in terms of food security/insecurity. There are usually four subconstructs under food security: 'availability of food'; 'access to food'; 'stability of access'; 'utilization of accessible food'.	-	The theoretical framework contains a conception of 'food security' or 'food insecurity', which may be subdivided into four subconstructs similar to: 'availability'; 'access'; 'stability'; 'utilization'. The authors report that they use a framework based on a "Food security" or "food insecurity" approach. The authors report that they use a framework which is built on any of the following references: Løvendal C.R and M. Knowles, 2005. "Tomorrow's hunger: a framework for analyzing vulnerability to food insecurity". FAO-ESA Working Paper No. 05-07. FAO, Agricultural and Development Economics Division, Rome. FAO (2000) Guidelines for national FIVIMS. Background and principles. www.fao.org/docrep/003/X8346E/X8346E00.HTM
Livelihoo ds Approac h	This code refers to a series of similar frameworks which contain conceptions of 'livelihood capabilities', 'livelihood strategies', and 'livelihood assets'. The later is usually composed of natural, social, financial, physical, and human capital.	-	The theoretical framework contains a combination of some of the following constructs: 'livelihood capabilities', 'livelihood strategies', 'livelihood assets', 'natural capital', 'social capital', 'financial capital', 'physical capital', or 'human capital'. The authors report that they use a framework based on a "Livelihoods" or "Sustainable livelihoods" approach. The authors report that they use a framework which is built on any of the following references: Fraser, E.D.G, A. Dougill, K. Hubacek, C. Quinn, J. Sendzimir, and M. Termansen. 2010. Assessing vulnerability to climate change in dryland livelihood systems: conceptual challenges and interdisciplinary solutions. <i>Ecology and Society</i> . Chambers, R., and G. Conway. 1992. Sustainable rural livelihoods: practical concepts for the 21 st century. IDS Discussion Paper 296. Institute of Development Studies, Brighton, UK. Scoones, I. 1998. Sustainable rural livelihoods: a framework for analysis. IDS Working Paper 72. Institute of Development Studies, Brighton, UK DFID. (1999). <i>Sustainable Livelihoods Guidance Sheets.</i> London, UK: Department for International Development.
Other framewo rk	This denotes that a framework is used which doesn't not fall into any of the other frameworks specified.		

Subsequently, graphical representations were created for each theoretical framework in each paper. These were created as indicated in the instructions and had the purpose of serving as easily digestible summaries of the frameworks which were consulted upon throughout the review process. Finally, operationalizations (direct and indirect) were identified, coded and added to the construct tables which are included in Appendix C.

This set of steps was executed on all 35 articles. The article-specific construct tables produced through this can be found in Appendix C. In total, 358 article-specific constructs were identified, of which 281 were defined (in some cases through reference to other works), of which 154 were directly operationalised. A summary table outlining these figures is in Appendix D.

In terms of framework codes, the following table indicates which codes were applied to which articles. From the table it can be seen that 12 articles were coded as IPCC; 7 as 'Vulnerability as Expected Poverty' (VEP); 4 as Food Insecurity; 6 as Livelihoods Approach; and 19 as 'Other Framework'.

It should be noted that one of the articles (Hahn, Riederer, and Foster 2009), presented two distinct frameworks. Therefore two different graphic summaries were produced (Hahn et al A; Hahn et al B), and the coding applied to these two graphics differs.

The fact that 19 were coded using the miscellaneous 'Other Framework' code suggests that the initial categorisation was appropriate for less than half of the articles under review. It should be noted in particular that this coding framework relied on authors' own declarations of frameworks or approaches and as such, the outcome of the coding exercise would suggest the need for a systematic approach to detecting frameworks and approaches in this field. A more structured approach to framework categorisation was done next.

Article	Framework codes
(Antwi-Agyei et al. 2013)	IPCC; Livelihoods Approach
(Baca et al. 2014)	IPCC;
(Berkes and Ross 2013)	Other Framework
(Bogale, Taeb, and Endo 2006)	Other Framework
(Calvo and Dercon 2013)	Vulnerability as Expected Poverty
(Capaldo et al. 2010)	Food insecurity
(CARE 2009)	IPCC;
(Chhihn and Poch 2012)	Vulnerability as Expected Poverty
(Dasgupta and Baschieri 2010)	Other Framework
(Deressa, Hassan, and Ringler 2009)	Vulnerability as Expected Poverty
(Eakin, Winkels, and Sendzimir 2009)	Livelihoods Approach; Other Framework
(Eakin et al. 2012)	Other Framework
(Échevin 2011)	Vulnerability as Expected Poverty; Other Framework
(Ford and Smit 2004)	Other Framework
(Füssel and Klein 2006)	IPCC;
(Gandure, Walker, and Botha 2013)	Other Framework
(Günther and Harttgen 2009)	Vulnerability as Expected Poverty; Other Framework
(Hahn, Riederer, and Foster 2009)	IPCC; Livelihoods Approach; Other Framework
(lonesco et al. 2009)	IPCC; Other Framework
(Jamir et al. 2013)	IPCC;
(Khan and Salman 2012)	Other Framework
(Luers et al. 2003)	IPCC;
(Marshall 2010)	Other Framework
(Mengistu 2011)	Other Framework
(Misselhorn 2005)	Food insecurity; Livelihoods Approach
(Mubaya et al. 2012)	Other Framework
(Mutsvangwa 2011)	Vulnerability as Expected Poverty; Food insecurity

(Nkondze, Masuku, and Manyatsi 2013)	Other Framework
(Notenbaert et al. 2013)	IPCC;
(Piya, Maharjan, and Joshi 2012)	IPCC; Livelihoods Approach
(Sallu, Twyman, and Stringer 2010)	Livelihoods Approach
(Sarris and Karfakis 2010)	Vulnerability as Expected Poverty
(Sietz, Choque, and Lüdeke 2012)	IPCC; Food insecurity; Other Framework
(Tesso, Emana, and Ketema 2012)	IPCC; Other Framework
(Westerhoff and Smit 2009)	Other Framework

Synthesis of frameworks and constructs

The second stage of analysis involved synthesizing the article-specific, author-reported constructs into a global set of analyst-generated constructs, the refinement of the initial categorization of frameworks, and the generation of a set of ideal-type representations of these frameworks.

Listed below are the first seven steps of this stage, followed by a description of the method.

- 2.1 Import into NVivo all Images created as exports of graphic summary models created in Stage 1 (Output 1.c). For each graphic summary, identify which nodes under 'Emic Frameworks' have been included as project items in the model, and apply that node(s) to the graphic summary.
- 2.2 Create a new word document and paste the template of the table 'Emic-Ideal framework map' that is included below. For each node created under 'Emic frameworks', list it in a separate row in the table (output 2.a).
- 2.3 Create a new node called 'Bridging Frameworks Emic-Ideal'. Retrieve all graphic summaries coded with the 'other framework' node. Compare the graphics to see if any clusters of frameworks can be identified. For each cluster identified, create as a sub-node under 'Bridging Frameworks Emic-Ideal' a node of any name and apply to the relevant graphic summaries. Create a new node under 'Bridging Frameworks Emic-Ideal' called 'Residual' and apply this to all graphic summaries for which a cluster was not identified. In the centre and right column in the Emic-Ideal table, on the row corresponding to 'other frameworks', using 'split cells' subdivide creating a row for each node newly created under 'Bridging Frameworks Emic-Ideal'. Add the name of each node into the rows in the centre column.
- 2.4 Run a cluster analysis, clustering graphic summaries by nodes under 'Emic frameworks'.
- 2.5 For each cluster of identified stated frameworks (excluding those coded as 'residual'), beginning with those clusters created from a single framework node, retrieve all graphic summaries in that cluster. Following the principles of constant comparative analysis and cultural domain analysis, and with knowledge from the field, make a subjective judgement as to whether that group of frameworks are 'of a kind' and should constitute an ideal type framework, or whether more subdivision is necessary. Where more subdivision is considered necessary, create and apply an additional set of sub-nodes under "Bridging Frameworks Emic-Ideal' of the form "[e.g. IPCC]-A", "[e.g. IPCC]-B". When no more subdivision is necessary, or if no subdivision is considered necessary to begin with, proceed to the next cluster. When all clusters formed through singular framework nodes. Where clusters formed through combinations of framework nodes. Where clusters formed through combinations of framework nodes. Where clusters formed through combinations of framework nodes. Where subdivision, create nodes under 'Bridging frameworks Emic-Ideal' as appropriate. When all frameworks have been scrutinised, add the names of the new nodes to the appropriate cells in the centre column of the "emic-ideal" table, splitting cells as in the previous step.
- 2.6 For each category of framework (including residuals), retrieve one graphic summary as a representative example of that framework. Compare across frameworks and make a subjective judgement as to whether each framework is sufficiently distinct to be considered separate frameworks. Where it is considered that two (or more) examples are of the one framework, create a

node under 'Bridging Frameworks Emic-Ideal' called 'merged: [name of framework 1]-[name of framework 2]". Retrieve all graphic summaries represented by these two (or more) examples and code with this new node. Continue this analysis until all representative examples constitute distinct frameworks. Add the names of any new nodes created to the emic-ideal table as in previous steps.

2.7 For a framework where no subdivision or merging was considered necessary, create a sub-node under "Bridging Frameworks Emic-Ideal" using a name of the form "unchanged-[name of framework]" and apply to all relevant graphic summaries.

These steps involved inspecting the framework clusters that were created in the first stage of analysis. Inspection here had the aim of generating uniform and discreet categories of frameworks. This was done through two steps of inspection. First, within each cluster, the graphic summaries of the article-specific frameworks were compared in order to tell if they were 'of a kind'. Where clusters were not assessed to be 'of a kind', codes were to be applied to enable the cluster to be split into two 'domains' (Borgatti 1994). Once *with-in* examination was complete, representative examples of each cluster were compared in order to assess whether clusters were distinct. Where clusters were judged to be similar, codes were to be applied to enable a merger.

In step 2.3, the 19 'residual clusters' that is, clusters each comprising one framework which had been coded as 'Other framework', were examined to see if any non-trivial clusters could be detected. Only one cluster could be spotted: an extension of the VEP framework which was used by two articles (Échevin 2011; Günther and Harttgen 2009).

Excluding frameworks coded as 'other', there were 7 clusters to be inspected for uniformity (Step 2.5). Three clusters contained only one cluster each and so were deemed uniform by default. Three clusters were judged to be non-trivially uniform. And one cluster was subdivided. These assessments are recorded in the table below:

Table: Summary of within inspection of framework clusters			
Categories based on framework coding in stage 1 (excluding those coded as other)	Articles	Assessment based on within analysis	
IPCC	(Baca et al. 2014); (CARE 2009); (Füssel and Klein 2006); (Jamir et al. 2013); (Luers et al. 2003); (Notenbaert et al. 2013)	No subdivision of IPCC	
VEP	(Calvo and Dercon 2013); (Chhihn and Poch 2012); (Deressa, Hassan, and Ringler 2009); (Sarris and Karfakis 2010)	No subdivision of VEP.	
Food Insecurity	(Capaldo et al. 2010)	No subdivision by default	
Livelihoods Approach	(Hahn, Riederer, and Foster 2009) A; (Sallu, Twyman, and Stringer 2010)	Subdivide Livelihoods framework: Livelihoods A - (Hahn, Riederer, and Foster 2009) A Livelihoods B - (Sallu, Twyman, and Stringer 2010)	
IPCC & livelihoods Approach	(Antwi-Agyei et al. 2013); (Piya, Maharjan, and Joshi 2012)	No subdivision	
Livelihoods Approach and Food Insecurity	(Misselhorn 2005)	No subdivision by default	
VEP & Food Insecurity	(Mutsvangwa 2011)	No subdivision by default	

The resulting 8 clusters were then brought forward for *across* analysis as per step 2.6, along with the VEP extension cluster and the 17 remaining 'residual clusters'. Of the 26 clusters to be compared, only 4 were non-trivial clusters. Therefore only four representative frameworks needed to be chosen for the comparison, whereas 22 representatives were selected by default. This step resulted in judgments for three mergers to be made. This step is summarized in the table below.

Table: Record of framework <i>across</i> comparisons (step 2.6)			
Framework category	Includes	Representative selected for across comparison	To be merged?
Food security	(Capaldo et al. 2010)	default	With VE Food
Food Cooverity	(Misselberg 2005)	d o fo lt	security
Food Security - Livelihoods	(Misselhorn 2005)	default	No
VE Food Security	(Mutsvangwa 2011)	default	With Food
VE 1000 Security		deradit	security
IPCC	(Baca et al. 2014); (CARE 2009);	(Jamir et al. 2013)	Residual 7;
	(Füssel and Klein 2006); (Jamir et	· · · · · · · · · · · · · · · · · · ·	livelihoods
	al. 2013); (Luers et al. 2003);		integrated into
	(Notenbaert et al. 2013)		IPCC;
livelihoods	(Antwi-Agyei et al. 2013); (Piya,	(Piya, Maharjan, and Joshi 2012)	IPCC; Residual
integrated into IPCC	Maharjan, and Joshi 2012);		7
Livelihoods A	(Hahn, Riederer, and Foster	default	No
	2009) A		
Livelihoods B	(Sallu, Twyman, and Stringer 2010)	default	No
VEP	(Calvo and Dercon 2013);	(Deressa, Hassan, and Ringler	No
	(Chhihn and Poch 2012);	2009)	
	(Deressa, Hassan, and Ringler		
	2009); (Sarris and Karfakis 2010)		
oth-VEP Extensions	(Échevin 2011); (Günther and Harttgen 2009)	(Günther and Harttgen 2009)	No
Residual 1	(Berkes and Ross 2013)	default	No
Residual 2	(Bogale, Taeb, and Endo 2006)	default	No
Residual 3	(Dasgupta and Baschieri 2010)	default	No
Residual 4	(Eakin et al. 2012)	default	No
Residual 5	(Ford and Smit 2004)	default	No
Residual 6	(Gandure, Walker, and Botha	default	Mengitsu;
	2013)		Mubaya et al.;
			Westerhoff &
			Smit
Residual 7	(Hahn, Riederer, and Foster	default	IPCC;
	2009) B		livelihoods
			integrated into
	(1		IPCC
Residual 8	(lonesco et al. 2009)	default	No
Residual 9	(Khan and Salman 2012)	default	No
Residual 10	(Marshall 2010)	default	No Residual C
Residual 11	(Mengistu 2011)	default	Residual 6;
			Residual 12;
Desidual 12		d a fa cult	Residual 16
Residual 12	(Mubaya et al. 2012)	default	Residual 6;
			Residual 11;
Residual 13	(Nkondzo Macuku and Manustai	dofault	Residual 16
NESIUUDI 13	(Nkondze, Masuku, and Manyatsi 2013)	default	No

Residual 14	(Sietz, Choque, and Lüdeke 2012)	default	No
Residual 15	(Tesso, Emana, and Ketema	default	No
	2012)		
Residual 16	(Westerhoff and Smit 2009)	default	Residual 6;
			Residual 11;
			Residual 12
Residual 17	(Eakin, Winkels, and Sendzimir	default	No
	2009)		

There are three results of note arising from steps 2.1 to 2.7. First is the elimination of 'Livelihoods Approach' and 'Food Insecurity' as meaningful categories. This resulted from the observed trend that it makes less sense to speak of these as theoretical frameworks or research approaches in and of themselves than as substantive topics or concepts that are examined through a given framework. In the case of 'food insecurity', this was more often than not used as an extension to the VEP approach, such that food security was a measure of poverty. A second result of note is the still large number of articles that resist categorization. And thirdly, one further cluster was notices among the residual clusters – that of 'farmer perceptions'. This category was discovered through a repeated examination and comparison of frameworks and would not have been made as the authors do not declare to be following an established approach. Rather, grouping these together as an approach is a product of analysis.

Following the identification of frameworks, the next steps involved the identification of key constructs that make up that framework. The instructions are in the box below:

- 2.8 Create a new node called 'Key Emic constructs'. For each of the identified frameworks (excluding those coded as 'residual', or frameworks for which only one graphic summary exists), retrieve all graphic summaries coded under the relevant 'Bridging Frameworks Emic-Ideal' node. Identify those constructs that appear to have equivalences across all papers using that framework, create them (unless already present) as sub-nodes under 'Key Emic constructs', and apply them to the graphic summaries. Create a new document and paste the table "Framework defining constructs". List in the appropriate row in the second column those candidate equivalent constructs. For each residual framework or framework category with only one graphic summary, choose six constructs at the highest level of generality and create and apply nodes as above and paste construct names into the "Framework defining constructs" table.
- 2.9 For each framework category for which there are more than two graphic summaries in that category, consult the theoretical framework section of the relevant articles and identify any additional candidate equivalent constructs that appear in all but one of the relevant papers. Create these constructs (unless already present) as sub-nodes under 'Key Emic constructs', apply them to the graphic summaries, and add them to the third column in the "Framework defining constructs" table, listing in the adjoining cell those articles which fail to include it. For framework categories with more than three articles, identify all candidate equivalent constructs common in all but two¹³ of the relevant papers, add to the table with a reference to omitting articles, and then identify constructs in all but three and repeat.
- 2.10Create a new word document. Paste the tables 'Report of uniform and discreet frameworks' and 'report of uniform and discreet constructs' into the word document. For each distinct and uniform

¹³ Those constructs appearing in all but 2 and all but 3 articles are not to be coded. In this step they are merely identified and recorded in the table and maybe be returned to in future stages.

framework identified through the previous steps, fill in details of the name of the framework; a short description of the framework; the main constructs defining the framework¹⁴; and references to the articles in which they appear. Save this document as "Report of frameworks and constructs" (output 2.b).

- 2.11Create a new word document and paste the template of the table 'Emic-Etic construct map' that is included below. For each node created under 'Key Emic constructs' list it in a separate row in the table (output 2.c).
- 2.12Create a new node called "Bridging constructs GS-IT". Create three sub-nodes called "Unrecognised divergence", "Duplicate correction" and "Variance poor definition". For each construct in the emicetic table, identify which graphic summaries have been coded with this node and retrieve construct definitions from each of the relevant article-specific construct tables (Output 1.a). Where definitions cannot be retrieved, ignore this unless a divergence is identified. For each construct compare available definitions¹⁵ from each article in which it occurs, and make an informed judgement about whether they constitute the same construct. If not, create two (or more if more than two domains are identified) new sub-nodes under the node "Unrecognised divergence", naming them "[name of construct] A" and "[name of construct] B" and if there are articles in which the construct is not defined, create a sub-node under 'Variance poor definition' called '[name of construct]" and code the graphic summaries appropriately. Add the names of these nodes into the appropriate rows in the middle column of the Emic-Etic table. When satisfied that each construct appearing under the node in question does indeed refer to only one construct, move onto the next construct and repeat for all constructs identified under 'Key Emic constructs'
- 2.13When all constructs have been individually scrutinised for uniformity, compare representative definitions of each construct to ensure that they do indeed refer to distinct constructs. If not, create a new node under "Duplicate Correction" called "merged: [names of constructs]", and apply this code to the graphic summaries. In the Emic-Etic table, move the relevant Emic constructs so that their rows adjoin, merge the two (or more) cells in the centre column, and enter 'merged: [names of constructs]' in the new cell.
- 2.14If any constructs have been sub-divided or merged, retrieve the relevant graphic summaries and scrutinise the frameworks for uniformity and discretion following the procedures in 2.4 and 2.5. Update¹⁶ the table 'Report of uniform and discret frameworks'.
- 2.15Retrieve the document 'Report of frameworks and constructs"¹⁷. For each construct listed in the centre column of the 'Emic-etic map', list it in the first column of the table 'Report of uniform and discreet constructs"¹⁸. Consult the list of article specific tables of emic constructs (Output 1.a) and

¹⁴ Note on implementation: When I encountered this step I chose to defer creating lists of framework-defining constructs until after constructs have been scrutinised. Thus in step 2.14, rather than updating the table, I will be creating the lists for the first time.

¹⁵ Ideally, papers will provide conceptual definitions about what it is in the world that they wish to represent by using the construct. In cases where this ideal is not met, for example when their definitions resemble operational definitions (i.e. what empirical phenomena do they use to represent this construct), the coder shall try on the basis of available construct definitions and if necessary discussions in theoretical frameworks, to answer the question 'do these two constructs strive to represent the same phenomena'? However, if this is not possible, those constructs that are defined operationally will be treated as undefined constructs in this and the following step.

¹⁶ I didnt create constructs when first creating this table, so rather than update them, I create them from scratch.

¹⁷ To aid the transparancy and structure of the review process, I am adding some columns in which closedended responses are sought from the expert coder.

¹⁸ For the ease of readability when handing over to the expert, I will create names for these constructs, rather than using the node-name, which is probably uninterpretable to anybody not closely following the analysis.

retrieve definitions for each appearance of each construct. List definitions and references to source articles in the centre and right columns in the 'report of uniform and discreet constructs' table (Output 2.b).

It would be impractical and not useful to examine and compare all 358 emic constructs in the articles. Instead, a selection of framework-defining constructs was first made. That is, a set of constructs that are common across a given framework. The problem is that, in dealing with emic constructs, it is challenging to transparently identify constructs in different papers which are suspected to be equivalent. This becomes a chicken-and-egg situation. The solution is to make an imperfect selection of suspected equivalent constructs, which are later examined, after which the set of framework-defining constructs are updated.

Step 2.8 and 2.9 are an attempt to select important constructs in a structured by imperfect way. The 'framework-defining table' can be viewed in Appendix E and illustrates which constructs were selected for which frameworks. Where constructs in different papers had the same names they were provisionally presumed to be equivalent. In other cases, constructs of different names were suspected to be equivalent based on factors such as similarity of names, positions in graphic summaries, or similarity of employment.

In step 2.10 a start was made in generating the report of frameworks and constructs, but as stated in the footnote, part of this step was deferred until later – that is, I did not create lists of constructs immediately, because I felt that listing constructs while still dealing with author-reported constructs would add confusion and, moreover, the list of constructs would be subject to change in the following steps.

In Step 2.11, all emic constructs identified in steps 2.8 and 2.9 were listed in a skeleton of a map between author-reported emic constructs and (eventual) analyst-generated etic constructs. In doing so, all constructs with the same name were treated as one. This provided us with a total of 114 emic constructs. The purpose of this map is to allow a record of the move from emic constructs to etic constructs, and a record of how such movement was made. The map was only to be completed at Step 2.18, so it will be returned to the description of the steps that follow.

These 114 constructs (suspected of being important), were then brought forward for scrutiny. As with the scrutiny of framework clusters, scrutiny of constructs was done first *within* a set of constructs of the same name to test for uniformity, and secondly, *across* constructs to test for distinction. Step 2.12 involved *within* analysis.

Analysis was done on the basis of construct definitions. In some cases, in the first stage of analysis where construct definitions were identified, constructs were defined by authors through reference to other works. In this review, we recorded these references. However we adopted as a reliable threshold that we would only follow references in cases where a page number was provided in the reference. As it happened, in no case was this threshold reached. Therefore, in no case did we chase references. Nevertheless, comparison was made on the basis of available information. For example if two articles each had a construct of the same name which they declare is based on the works of the same reference, then it may be concluded that they are the same construct.

This analysis is recorded in the table in Appendix F. 100 of the 114 constructs appeared in only one article, with the implication that they were each uniform by default. Therefore only 14 sets of construct definitions were inspected for uniformity. Of these, 10 were judged to be uniform, and 4 were split. Those which were split were 'Adaptive capacity'; 'Livelihood vulnerability'; 'Sensitivity'; and 'Vulnerability'.

After *within* analysis, *across* analysis was performed. As per the instructions for Step 2.13, a representative definition was selected for each construct (in many cases this selection was made by default). Records of the selection of representatives are in the table in Appendix F. This analysis was done through a cross-tabs comparison in Excel. In total, 26 representative definitions were assessed to be equivalent to one or more others. Out of these 26 definitions, 7 merged constructs were created. Details of these mergers are listed in Appendix G.

Notable among the mergers made was the merger of 'adaptation to long term climate change' and 'Farmer perceptions'. This lent support to the earlier decision to merge the articles in which they appear into one new framework (Farmer Perceptions).

The next step, 2.14, involved selecting from this new set of constructs, constructs to list in the report of frameworks and constructs. The rationale of creating such a report is to create a formalized record of the theoretical frameworks and their key constructs uncovered by this review. Significantly however, it also allows the classification generated by the lead reviewer (Aogán Delaney) to be inspected by the member of the review team with most expertise in the field (Todd Crane).

As a method of selecting constructs for inclusion in the Report, first for each framework all graphic summaries were consulted. The summary with the least amount of constructs was then examined and for each construct the other graphic summaries in the framework cluster were examined to see if the constructs were appearing in all or all bar one of the other frameworks (And for a framework with over five papers, this threshold was lowered to all bar 2 – specifically, the IPCC framework). A list was made of such recurrent constructs and then I moved on the next smallest graphic summary in the framework to see if there were any leftover constructs that appear in all bar the first summary. This method was repeated for each framework. The lists used in this method are included in Appendix H for reference.

The Report of frameworks and constructs was then updated following Steps 2.14 and 2.15.

The next set of steps deals with cross-examining this set of frameworks and constructs by another member of the team, and then moving from emic, author-reported constructs and frameworks to etic analyst-generated constructs and frameworks. The instructions for these steps are in the box below:

- 2.16The report finalised in step 2.13 is to be reviewed by a member of the research team with expertise in the field. The expert will first verify the classifications of frameworks and constructs produced in this Stage. Secondly, the expert will examine frameworks and judge which frameworks are relevant for the review, marking it "Retained", and which ones are to be excluded from further analysis, marking them "discarded".
- 2.17 If any revisions are recommended by the reviewer, the lead researcher is to create and apply appropriate codes and update the report following the procedures already outlined above. The updated report is to be again reviewed by a member of the research team with expertise in the field, and if necessary recoding and updating is to be repeated. When no revisions are recommended, this most recent version of the report is to be saved as a pdf (Output 2.b).
- 2.18Create a new node called "Etic constructs". Consult the verified report of constructs. For each construct¹⁹, create a node under "Etic constructs". Code all Graphic Summaries with this new code set. In the "Emic-Etic construct map" fill in the names of the nodes created under "Etic constructs" into the

¹⁹ This step is to be done after the following step. First graphic Summaries are to be coded as retained or discarded. Then Etic construct nodes are only to be created for the constructs appearing in the retained frameworks. However, once created, they are to be applied to all graphics, even those which have been discarded (because irrelevant frameworks might still operationalize relevant constructs).

appropriate cells in the right column (Output 2.c).

- 2.19Under the 'Residual' node, under the node 'Bridging Frameworks Emic-Ideal', create two sub-nodes called "retained" and "discarded". For each graphic summary²⁰, check the report and following the guidance on which frameworks are to be retained or discarded, apply the appropriate nodes to the graphic summaries.
- 2.20Create a new node called "Ideal type Frameworks". Consult the verified report of frameworks. For each framework, excluding discarded residuals, create a node under "Ideal type Frameworks". Code all Graphic Summaries with this new code set. In the "Emic-Ideal framework map" fill in the names of the nodes created under "Ideal type Frameworks" into the appropriate cells in the right column (Output 2.a).
- 2.21For each ideal type framework, consult the verified report of frameworks and create a new Model with the name of the present ideal type, and using 'add project items' add all defining construct nodes under 'etic constructs'. Arrange these items to graphically represent the framework. Repeat for each ideal type framework. This set of models constitutes output 2.d.
- 2.22Create a new model. Using 'add project items', add all etic codes. Arrange to graphically create a theoretical meta-framework, using those constructs found in overlapping ideal types as points of merger. This constitutes output 2.e and Project Output 1.

The Report finalized in Step 2.15 was handed over from Aogán Delaney to Todd Crane. Prior to hand-over, the Report was converted into a questionnaire format in order that the feedback be recorded and structured. The purposes of this exchange was to see if the categorization that was create through a structured review process, if that was meaningful to somebody who was familiar with the domain in which such categorization would be applied. It could be described as a refutational analysis. A second purpose was to steer the further course of the review. Todd was asked to indicate among the frameworks uncovered by the review, which ones were relevant for the purposes of the CCAFS project, and which ones were not.

This inspection made a number of suggestions. In terms of frameworks, 4 frameworks were suggested to be collapsed into one ('Vulnerability as Expected Poverty'; 'Vulnerability as Expected food security'; 'Vulnerability as Expected Poverty – multi-level analysis'; 'Asset vulnerability (Residual)'), while it was also suggested to merge a residual article (Mathematical formalisation of vulnerability) into the IPCC category.

15 (included the 4 to be collapsed) frameworks were considered relevant to the purposes of the review, (IPCC; Vulnerability as Expected Poverty; Vulnerability as Expected Poverty – multi-level analysis; Perceptions of climate change; Asset vulnerability; Nested Vulnerability; Current and future vulnerability; Livelihood vulnerability index; Mathematical formalisation of vulnerability; Intensifying vulnerability to food insecurity; Nkondze et al (2013); Patterns of smallholder vulnerability; Livelihood trajectories and resilience and vulnerability; Determinants of Resilience) and 5 were considered not relevant (Community Resilience; Choice of property rights regime; Disaster resilience of rural livelihoods; Regional vulnerability; Social Resilience). The feedback on frameworks in questionnaire form can be found in Appendix I.

Of these suggested changes, the first reviewer accepted all decisions regarding retention or discarding of frameworks for the remainder of the review. As regards the suggestion to merge four frameworks into one, the first reviewer strongly suspected that such a categorization would not survive empirical scrutiny. He asked the expert reviewer to look at this suggestion again and on second inspection he concluded that the 'Asset vulnerability' framework was not compatible with the 'Vulnerability as Expected Poverty' frameworks.

²⁰ It may be that clusters of frameworks are also considered not relevant.

As regards the suggestion to merge the three econometric frameworks, this new classification was examined and appeared feasible based on the presence of a set of core constructs across all articles. Nevertheless, constructs that were specific to the 'extensions' of this framework were not discarded from further review, even though statistically they now appeared trivial when diluted in a larger category. This was a decision that was taken by the reviewer.

The decision to merge the Mathematical formalisation of vulnerability into the IPCC category was also validated.

In terms of constructs, two mergers were suggested: the constructs that had been previously split into 'Adaptive Capacity A', 'Adaptive Capacity B', and 'Adaptive Capacity C' were recommended to be re-merged. Likewise the constructs that had previously been split into 'Sensitivity A' and 'Sensitivity B' were recommended to be merged again.

9 splits were recommended. These are summarized as follows:

- 'vulnerability' of Ionesco et al (2009)to be split from vulnerability IPCC construct
- The constructs of 'exposure' of Jamir et al's (2013), and Sietz et al's (2012)were not sufficiently welldefined to be verifiably of a kind with general concept of 'exposure'
- The constructs of 'Sensitivity' of Jamir et al (2013), and Notenbaert et al (2013)were not sufficiently welldefined to be verifiably placed in the same category as that of 'Sensitivity (A)'.
- The constructs of 'Adaptive capacity' of Jamir et al (2013), and Notenbaert et al (2013) are not sufficiently well defined to be verifiably placed in the same category as 'Adaptive Capacity (A)'.
- The construct of 'Household vulnerability to poverty' of Günther & Harttgen (2009) was not sufficiently well defined to be verifiably placed in the same category as 'Vulnerability (B)'.
- The constructs of 'poverty line' and 'minimum consumption(income) level' of Calvo & Dercon (2013) and Deressa et al (2009), respectively were not sufficiently well-defined to be verifiably placed in the same category as 'poverty'.
- 'Household level' as defined by Échevin (2011) and by Günther & Harttgen (2009) contained to little information to be placed in the same category as one another.
- 'Community level' as defined by Échevin (2011) and by Günther & Harttgen (2009) contained to little information to be placed in the same category as one another.
- The construct 'Adaptation to long-term climate change' of Gandure et al (2013) contained too little information to be placed verifiably in a category with 'Farmer perceptions' of (Mubaya et al. 2012).

The first reviewer then set about examining the review by the expert. The suggested mergers were validated – the discrepancy between the initial decision to split and the subsequent agreement to merge the split can be explained in terms of *acceptable degree of difference*. The comments of the reviewer who is familiar with the field suggested that the threshold of an acceptable degree of difference used by the first reviewer was smaller than is necessary.

In terms of suggested splits, some were validated and some refuted. Reasons for refuting a suggested split include that poor definitions nevertheless contained references to common publications or where constructs had initial been merged not so much on their similarity to one another, but instead on how different they were from others, and that overlapping they formed something distinct from the others. Closer detail on the validation and refutation of suggested splits is contained in Appendix J.

Due to time pressures, the refutation of the refutation was not handed back among the team. Nevertheless, consensus between the reviewers was reached at the level of frameworks. Therefore potential disagreement can be limited to the level of constructs.

In NVivo, codes were applied with respect to the retention or discarding of frameworks (Step 2.19) and then a node-set of etic constructs was created based on the classification finalized in Step 2.17. This set of etic construct nodes was then filled into the Emic-Etic construct map to complete it. The finalized Emic-Etic construct map can be seen in Appendix K. Similarly, NVivo nodes were created to denote analyst-generated

ideal type research frameworks based on the classification finalized in step 2.17, and the Emic-Ideal Framework map was completed (Step 2.20). This map is shown below:

Emic-Ideal Framework map			
Emic stated frameworks	Bridging frameworks Emic-Ideal	Etic/Ideal type Frameworks	
Food security	Merged [Food Security][VE Food	Vulnerability as expected	
	security][oth-VEP	poverty, with extensions	
	Extensions][unchanged]		
	Food Security - Livelihoods	Intensifying vulnerability to food	
		insecurity	
IPCC	Merged [IPCC][Livelihoods	IPCC	
	integrated into		
	IPCC][Residual7][Residual8]		
Livelihoods approach	Livelihoods A	Livelihood vulnerability index	
	Livelihoods B	Livelihood trajectories and	
		resilience and vulnerability	
	Merged [IPCC][Livelihoods	IPCC	
	integrated into		
	IPCC][Residual7][Residual8]		
	Food Security - Livelihoods	Intensifying vulnerability to food	
		insecurity	
VEP	Merged [Food Security][VE Food	Vulnerability as expected	
	security][oth-VEP	poverty, with extensions	
	Extensions][unchanged]		
Other framework	Merged [Food Security][VE Food	Vulnerability as expected	
	security][oth-VEP	poverty, with extensions	
	Extensions][unchanged]		
	Residual	Asset vulnerability	
		Current and future vulnerability	
		Determinants of Resilience	
		Livelihood trajectories and	
		resilience and vulnerability	
		Nested Vulnerability	
		Nkondze et al (2013)	
		Patterns of smallholder	
		vulnerability	
	Merged [IPCC][Livelihoods	IPCC	
	integrated into		
	IPCC][Residual7][Residual8]		
	Merged [Residual6][Residual11]	Perceptions of climate change	
	[Residual12][Residual16]		

For each framework then, a graphical model was to be created in NVivo using etic constructs. These steps were originally designed in order to aid understanding and digestion of the frameworks. However, for three principal reasons, they did not work out very well. First, the level of attrition in not converting poorly-defined emic constructs into etic constructs means that for some frameworks, the models contain an incomplete set of constructs. Secondly, because of the structured approach in selecting framework-defining constructs, an arbitrary number of 6 constructs were selected for each residual framework. Because of this arbitrary number, most of these models appear erratic. Third, I did not synthesize a set of analyst-generated construct relations, and so the relations between the constructs, if at all present, is implicit.

Each model is incorporated into the final set of the results, which will be introduced later in this report.

Transparency assessment of operationalized constructs.

The third stage of analysis comprised transparency assessments of operationalized constructs. A transparency instrument was designed based on that developed by Da Silva (2014), with five adaptations. First, Da Silva's instrument was developed to appraise an article as a whole, whereas the present study conducts assessment at the level of the operationalization. Therefore only a subset of the 7 items in Da Silva's framework are used (Data collection methods reported; sampling strategies reported; sample sizes reported; data analysis methods reported). Secondly, an additional criterion is added to ask whether the article reports the operational questions or data collection instruments to represent the construct. Third, a criterion is added which asks whether the construct being operationalized has been defined in the paper, using the codes for construct definitions in the first stage of research (output 1.b). Fourth, while Da Silva lists three values for many criteria (e.g. missing; unclear; clear), here only dichotomies are used (e.g. missing or unclear; clear). One exception to this is the value '2ndary data', where allowances are made for less than full reporting when authors use an existing data source. And finally, an additional value is created for when sufficient information is not reported in the article, but where it is stated that more information is available from the authors. This should be seen as a temporary code: further information should be requested from the authors to complete the review and a final value is to be given when that information arrives. In the execution of this review, authors were not contacted due to the timeframe of the project.

The purpose of this Assessment is as a preliminary stage of screening for validity assessments. The logic at work is that a certain amount of information is necessary in order to be able to assess the validity of an operationalization. In this stage, both the necessary information is extracted from the articles, and a screening out of operationalizations is done for those which are not transparently reported.

This assessment instrument sets a high standard of compliance: For an operationalization to be considered transparently reported it must receive a positive evaluation on four out of six of these criteria. Allowances are made for operationalizations in which sampling sizes and strategies are not reported.

Instructions for this step were specified as follows:

- 3.1 Consult the Graphic summaries. For each GS which has been coded as 'retained', create a new word file called "structured summaries for transparency assessment [authors]". Consult the corresponding article-specific table of construct (output 1.a). For each directly operationalized construct, create a table in the new word file using the template below. For those Graphic Summaries which have been coded as 'discarded' but which have been coded with one or more Etic construct nodes, create a new word file called "structured summaries of relevant constructs for transparency assessment [authors]". For each etic construct, consult the article-specific table of constructs and for each construct through which the etic construct(s) is operationalize, paste the table 'Structured summary of operationalization transparency assessment' into the word file.
- 3.2 For each operationalization, consult the third column in the article-specific table of construct (output 1.a). If this text segment contains a statement that further information is available, then create two sub-node called 'construct definition info requested' and 'Inconclusive Operationalization' under the appropriate article-specific construct node, and apply these to the relevant segment of text coded as 'operationalized'. For those with a definition provided, fill in 'yes' in the middle column of the 'construct defined' row in the structured summary, and copy the coded text and paste it into the third column.
- 3.3 For each operationalized construct, return to the article and search for specification of what data collection methods are used in this operationalization²¹. If there is explicit mention of data collection

²¹ where a study uses existing data (in whole or in part), then data collection methods, sample strategies, sample sizes, survey questions for the existing data are unlikely to be reproduced in the report. In such cases I

methods for the operationalization, create a sub-node called 'DCM reported' under the appropriate article-specific construct node and, code that segment of the text, fill in 'yes' in the appropriate cell in the structured summary, copy and paste the relevant text into the adjoining cell, and then proceed to the next operationalization. If data collection methods are either not explicitly or are ambiguously specified, and if there is no indication in the paper that more information is available from the authors then create and apply the sub-nodes 'DCM inadequately reported' and 'NON-transparent Operationalization' to the segment of text coded as 'operationalized', fill in 'no' in the appropriate cell in the structured summary, include a rationale in the adjoining cell, and fill in 'NOT Transparent' in the final cell in the table. Exclude this operationalization from further steps in the transparency assessment tool. If data collection methods are either not explicitly or are ambiguously specified, but the article states more information is available from the authors then create and apply the sub-nodes 'DCM indeguately reported' or are ambiguously specified, but the article states more information is available from the authors then create and apply the sub-nodes 'DCM info requested' and 'Inconclusive Operationalization' (if this conclusion code has not already been applied) to the segment of text coded as 'operationalized'.

- 3.4 For each operationalized construct, return to the article and search for specification of indicators and/or questions used in the data collection instrument²². If there is explicit mention of at least one indicator or question for the operationalization, create a sub-node called 'OpQ-I reported' under the appropriate article-specific construct node and, code that segment of the text, fill in 'yes' in the appropriate cell in the structured summary, copy and paste the relevant text into the adjoining cell, and then proceed to the next operationalization. If no indicators or questions are specified, and if there is no indication in the paper that more information is available from the authors then create and apply the sub-nodes 'OpQ/I inadequately reported' and 'NON-transparent Operationalization' to the segment of text coded as 'operationalized', fill in 'no' in the appropriate cell in the structured summary, include a rationale in the adjoining cell, and fill in 'NOT Transparent' in the final cell in the table. Exclude this operationalization from further steps in the transparency assessment tool. If no indicators or questions are specified, but the article states more information is available from the authors then create and apply the sub-nodes 'OpQ/I info requested' and 'Inconclusive Operationalization' (if this conclusion code has not already been applied) to the segment of text coded as 'operationalized'.
- 3.5 For each operationalized construct, return to the article and search for specification of sampling strategies used to select the research units on which data is collected²³ for this operationalization²⁴. If there is explicit mention of sampling strategies for the operationalization, create a sub-node called 'Sampling Strategies reported' under the appropriate article-specific construct node and code that segment of the text, fill in 'yes' in the appropriate cell in the structured summary, copy and paste the relevant text into the adjoining cell, and then proceed to the next operationalization. If there is no discussion of sampling strategies, and if there is no indication in the paper that more information is available from the authors then create and apply the sub-nodes 'Sampling strategies inadequately reported' and 'NON-transparent Operationalization' to the segment of text coded as 'operationalized', fill in 'no' in the appropriate cell in the structured summary, include a rationale in the adjoining cell, and fill in 'NOT Transparent' in the final cell in the table. Exclude this operationalization from further steps in the transparency assessment tool. If sampling strategies are not discussed in the article, but the article states that more information is available from the authors information is available from the article, but

take it that if a paper refers to an existing data source, then it can be assumed for the purposes of coding that data collection methods, operational questions, sample strategies, and sample sizes have been reported. At a later stage, the adequacy of such sources of data will be assessed (by an expert). However, it is still necessary that papers report how they analyzed such data.

²² For constructs operationalized through existing data, see footnote in step 3.3.

²³ In some cases, an article presents a methodology as the *outcome* of the paper, rather than as a means of research. In such cases, it is unlikely that sample strategies or sample sizes are stipulated. Therefore, for such papers, it is admissible that sample strategies and sizes are not reported.

²⁴ For constructs operationalized through existing data, see footnote in step 3.3.

nodes 'Sampling strategies info requested' and 'Inconclusive Operationalization' (if this conclusion code has not already been applied) to the segment of text coded as 'operationalized'.

- 3.6 For each operationalized construct, return to the article and search for specification of sample sizes²⁵ of the research units on which data is collected²⁶ for this operationalization. If there is explicit mention of sample size for the operationalization, create a sub-node called 'sample-size reported' under the appropriate article-specific construct node and code that segment of the text, fill in 'yes' in the appropriate cell in the structured summary, copy and paste the relevant text into the adjoining cell, and then proceed to the next operationalization. If sample sizes are either not explicitly or are ambiguously stated, and if there is no indication in the paper that more information is available from the authors then create and apply the sub-nodes 'Sample size inadequately reported' and 'NON-transparent Operationalization' to the segment of text coded as 'operationalized', fill in 'no' in the appropriate cell in the structured summary, include a rationale in the adjoining cell, and fill in 'NOT Transparent' in the final cell in the table. Exclude this operationalization from further steps in the transparency assessment tool. If are not discussed in the article, but the article states more information is available from the authors then create and apply the sub-nodes 'Sample size indecused' sample size info requested' and 'Inconclusive Operationalization' (if this conclusion code has not already been applied) to the segment of text coded as 'operationalized'.
- 3.7 For each operationalized construct, return to the article and search for specification of what data analysis methods are used in this operationalization. If there is explicit mention of data analysis methods for the operationalization, create a sub-node called 'DAM reported' under the appropriate article-specific construct node and code that segment of the text, fill in 'yes' in the appropriate cell in the structured summary, copy and paste the relevant text into the adjoining cell, and then proceed to the next operationalization. If data analysis methods are either not explicitly or are ambiguously specified, and if there is no indication in the paper that more information is available from the authors then create and apply the sub-nodes 'DAM inadequately reported' and 'NON-transparent Operationalization' to the segment of text coded as 'operationalized' , fill in 'no' in the appropriate cell in the structured summary, include a rationale in the adjoining cell, and fill in 'NOT Transparent' in the final cell in the table. Exclude this operationalization from further steps in the transparency assessment tool. If data analysis methods are either not explicitly or are ambiguously specified, but the article states more information is available from the authors then create and apply the sub-nodes are either not explicitly or are ambiguously specified, but the article states more information is available from the authors then create and apply the sub-nodes 'DAM info requested' and 'Inconclusive Operationalization' (if this conclusion code has not already been applied) to the segment of text coded as 'operationalized'.
- 3.8 Consult the article-specific document of structured summaries and consult the node structure for constructs appearing in that article. For each operationalization that has <u>not</u> been labeled as "NOT Transparent" in the final cell of its table, check its node structure to see if it has been coded with 'Inconclusive Operationalization'. Create a new word document called "Inconclusive operationalizations authors to contact". Assemble into this document a list of inconclusive operationalizations appearing in an article, and the incomplete structured summary tables. Authors will not be contacted in this project, but this document forms an important reference point for any follow-up study (output 3.a).
- 3.9 Create a new parent-level node called 'Transparent Operationalization'. Consult the article-specific document of structured summaries For each operationalization that has been assessed positively for each of the six criteria, fill in 'yes' in the final cell of the structured summary, apply the node 'Transparent Operationalization' to the text coded around 'operationalization'. At the top of the article-specific document of structured summaries create a list of transparently operationalized constructs (output 3.b).
- 3.10Repeat Steps 3.1 3.9 for each article whose graphic summary was coded as 'retained'.

²⁵ For constructs operationalized through existing data, see footnote in step 3.3.

²⁶ For articles which present rather than implement a methodology, se footnote in step 3.5.

3.11For each article whose framework was coded as 'discard', check each coded construct in the record of comparisons of emic constructs (step 2.13) and see if it has been merged with any constructs appearing in a retained framework. For each relevant construct, repeat steps 3.1-3.9.

The template used to create structured summaries is as follows:

Structured summary of operationalization – transparency assessment			
Construct: [name]			
Article:			
Criterion	Assessment	Quoted text or Rationale for negative assessment	
Construct defined?	Yes/no		
Data collection methods reported?	Yes/no		
Reporting of indicators/questions	Yes/no		
used to operationalize construct?			
Sampling strategies reported?	Yes/no		
Sampling sizes reported?	Yes/no		
Data analysis methods reported?	Yes/no		
Conclusion			
Transparency Conclusion:	Yes/no		

This Stage was executed as per the instructions with the exception that authors were not contacted.

As with comparison of constructs, where definitions were partial but contained references to other works, these were assessed to be defined.

This assessment was carried out on 147 defined directly operationalized article-specific constructs. Of these, 113 were assessed to be transparent, and 27 were assessed as not transparent, while 7 were considered partially transparent or were inconclusive until authors are contacted.

Operationalizations that were assessed as transparent were brought forward to the next stage for validity assessment. Structured summaries of those operationalizations which were not assessed to be transparent are included in Appendix L.

Validity and feasibility assessment of operationalized constructs

Da Silva's Transparency instrument was itself constructed around the needs of the quality assessment checklist of Kampen and Tamás (2014). However, as noted by Da Silva, it is not practical to apply the quality assessment checklist unless you have substantial knowledge of the field of research in question (2014). Therefore this Stage of analysis was carried out solely by the team member with the most knowledge of the field (Todd Crane).

A validity assessment was conducted on the basis of the data collected in the transparency assessment. Two criteria for validity were used:

- 1. The data collection methods correspond to the epistemological type of data required to represent the construct as defined.
- 2. The data collection methods, instruments, and analysis methods provide a complete and valid understanding of the construct defined.

To be considered valid, both criteria had to be satisfied.

In addition to validity, an assessment of feasibility was also conducted. This involved a subjective judgment about whether the operationalization of each construct was feasible to be executed within the CCAFS program.

This validity assessment instrument was executed on the transparently operationalized, directly operationalized, defined constructs²⁷. The complete assessment questionnaire is contained in Appendix M.

²⁷ Through mechanical error, three of the 147 transparent operationalizations were omitted from the validity assessment.

Integration of candidate operationalizations into ideal-type frameworks

The final stage of analysis involves integrating those article-specific operationalizations into the ideal-type research frameworks. This stage comprised two principal operationalizations. First, the etic constructs in the ideal-type frameworks were to be matched to article-specific operationalizations. Secondly, where more than one candidate operationalization was found for a given etic construct, a selection among them was to be made.

Due to deadlines in the timeframe of the project, selection among candidates was not completed prior to the handover of deliverables and the writing of this report. Therefore, the output was structured in such a way that first-choice candidate can be inserted once selected.

Instructions for the matching of etic constructs to article-specific operationalizations are the box below:

- 5.1 Create a new word document called 'Questionnaire candidate operationalizations'.
- 5.2 For each retained framework cluster, retrieve the article-specific construct tables (output 1.a) of the relevant articles, and for each of the constructs listed in the 'main constructs' cell in the report of frameworks and constructs (excluding constructs for which all immediate sub-constructs in the 'operationalized through' cell also appear in the 'main constructs' cell and where each of the sub-constructs appears in more than one paper; excluding also constructs which appear as sub-constructs of a higher-order construct but where the sub-constructs appear in only one paper), create a new section and heading in the 'questionnaire candidate operationalizations' document, and paste the 'Selection of most useful operationalizations' table. Repeat for each retained framework cluster. For residual frameworks, choose those constructs at the highest levels of operational chains, as represented in the 'operationalized through' cells, ensuring that all directly operationalized constructs are represented by some chosen construct. Create sections for these constructs in the 'questionnaire candidate operationalized constructs are represented by some chosen construct. Create sections for these constructs in the 'questionnaire candidate operationalized constructs are represented by some chosen construct. Create sections for these constructs in the 'questionnaire candidate operationalized constructs are represented by some chosen construct.
- 5.3 For each section in the 'questionnaire candidate operationalizations' document, open the relevant etic construct node in NVivo to see all articles in which that construct is (indirectly or directly) operationalized. Copy the table 'structured summary of candidate operationalizations' and in the current section of the document paste a table for each article in which the present construct is operationalized. Fill in the cells 'candidate article' and 'construct operationalized'. Repeat for each section.
- 5.4 For each candidate operationalization, retrieve from the article-specific construct tables, a list of all constructs through which the main construct is indirectly operationalized (if any), placing them either in the 'Intermediate constructs' or the 'Directly operationalized constructs' cells (if the construct is directly operationalized, leave these cells blank). If for a given candidate operationalization, an intermediate or direct construct also appears in a section of the questionnaire itself as a candidate operationalization, include 'SEE CANDIDATE SECTION' next to that construct and exempt it from any further analysis as an intermediate or direct operationalization.
- 5.5 For each candidate operationalization, consult the article in NVivo, opening either the relevant 'relationship nodes' or the nodes under 'construct relations'. Paste the coded text into the cell adjoining 'conceptual framework'. If the candidate operationalization consists of one directly operationalized construct, write 'DIRECT OPERATIONALIZATION' in this cell.
- 5.6 For each directly operationalized construct for a given candidate operationalization, insert it in the rows below the cell 'operationalization of sub-constructs'. Consult the completed validity questionnaire. For operationalizations which have been negatively assessed on any of the validity or feasibility questions, insert 'not valid/feasible' in the appropriate Data collection cells and exclude from further analysis. For constructs which are not present in the questionnaire, fill in 'not transparent/operationalized' in the appropriate cells'. For those that have been positively assessed, copy the data in the 'Data collection methods reported?' and 'Reporting of indicators/questions used to operationalize construct?' cells from

the validity questionnaire, and paste them into the corresponding 'data collection' and 'operational questions' cells in the candidate table.

- 5.7 For each candidate operationalization, retrieve from the article text describing the methods of analysis used to formulate findings at the level of the candidate construct. In NVivo, create a new sub-node called 'analysis of sub-constructs' under the relevant article-specific construct node, and apply to this segment of text. Copy this text and paste into the cell adjoining 'Candidate-level Analysis' in the candidate table. If no such description of analyses can be retrieved, fill in 'not reported' in the cell adjoining 'Candidate-level Analysis'
- 5.8 When tables for all candidate operationalizations for all relevant constructs in all frameworks are completed, make a copy of the document, calling it 'candidate operationalizations defaults retained'. In the original document, paste onto the first page of the template of instructions on how to complete the questionnaire, and delete each section for which only one candidate operationalization is offered. Hand the questionnaire document to a team member with expertise in the field. For each construct section, the expert is to select from among the candidate operationalizations three ordered preferences in terms of operationalizations that are useful for the purposes of the project. This selection is to be filled in in the 'selection of most useful' tables at the beginning of each section.

Step 5.2 outlines a complicated but structured process for the selection of constructs to be included as candidate operationalizations. This is based on using the set of etic constructs contained in the Report of Frameworks and constructs (See Appendix I) for each framework, and using the etic constructs as a guide, in each article in which the etic constructs have a corresponding emic construct, following the chain of operationalization as recorded in the article-specific construct tables (See Appendix C). The remainders of the steps 5.3 to 5.7 involve structured processes for gathering existing information necessary to have a full description of indirect operationalizations of a high-order construct. These steps were executed as instructed.

When all necessary data was gathered into the structured form, the next step (5.8) involved orientating this document into a structured questionnaire format to allow a selection to be made where there exists more than one candidate operationalization for a given etic construct. The questionnaire was to provide a transparent record of where selection between candidates was made for the purposes of providing the CCAFS program with those operationalizations most useful to their purposes for which they commissioned this review.

As mentioned previously, the timeframe of the project did not allow the questionnaire to be completed by the vulnerability expert in the team prior to the next steps, as had originally been intended. Therefore the lead reviewer continued the review process marking clearly any segment where the results of a selection were to be inserted.

Apart from candidate operationalizations, it then remained to select operationalizations for all etic constructs used in all retained frameworks. The instructions for doing so are in the box below:

- 5.9 Create a new word document called 'report of selected operationalizations of retained frameworks'. In this document, create a section for each retained framework.
- 5.10Within each section, from the 'main constructs' cell in the report of uniform and discreet frameworks, create a list comprised of the smallest possible number of constructs, which themselves are directly or indirectly operationalized in at least one article in which they appear, as evidenced in the article-specific construct tables, such that all constructs within the 'main constructs' cell can be said to be represented on the list either directly or by a higher order construct as denoted in the articles using this framework, specifically in the annotations of text coded by the node 'vertically composed' or as specified by

relationship nodes. Copy the table 'record of selection of constructs' and paste below the list of constructs. Insert each construct from the 'main constructs' cell into a new row in the left column of the table. In the center column insert the name of the construct in the newly created list which represents the construct in the adjoining cell. In the right column, paste the coded text which specifies a vertical relationship between the constructs in the left and center columns for that row. For constructs which are directly represented on the list, write 'directly represented' in the right-most column.

- 5.11For each construct on the list in each section, copy and paste the table "operationalization of constructs".
- 5.12For operationalizations which appeared in the *questionnaire*, retrieve that which was selected as the best example by the expert. Fill in 'expert selection' in the cell adjoining 'selected by', and give a justification given by the expert for the selection. Retrieve information from equivalent cells in the questionnaire. In addition, retrieve information on sampling strategies, sample sizes, and data analysis methods from the validity assessment report. If sampling strategies and sample sizes have been reported, and if data collection methods for a given sub-construct differ from those of the overall operationalization, paste this information into the appropriate cells. Otherwise paste 'not reported', 'not reported', or 'see candidate level analysis', respectively.
- 5.13For constructs which do not appear in the Questionnaire, that is those operationalizations for which only one valid operationalization can be found in the literature, fill in the tables using the methods outlined in steps 5.3 5.7 and in 5.11. This report of selected operationalizations of retained frameworks' constitutes output 5.a

Step 5.10 is comprised of a structured method to select the highest order constructs for each framework such that all key constructs for that framework are represented in the operationalization of those selected frameworks. Steps 5.11 to 5.13 consist of instructions for the gathering of the required existing data for the operationalizations, either through copying and pasting from the *Questionnaire* (in such cases marking clearly where candidate operationalizations are to be inserted once selected), or through repeating the process for those constructs for which only one (or none) examples exist. The results of this, including a record of the selection among etic constructs, can be seen in Appendix N.

Conversion to deliverables

A final stage of analysis involved structuring the resulting synthesis as a deliverable output. Instructions for this operation are in the box below:

- 6.1 For each framework, create a word document. Paste the 'framework summary' table into each document.
- 6.2 From the report of constructs and frameworks (output 2.b) retrieve information on the name of the framework, description of that framework, key constructs used in that frameworks, the definitions of those key constructs, and the articles using that framework. Paste this information into the appropriate cells in the table.
- 6.3 Copy the model of the ideal type framework (output 2.d) and paste it into the cell under 'Ideal type model'
- 6.4 For each key construct retrieve from the report of selected operationalizations document (output 5.a) the corresponding 'operationalization of constructs' table, and paste these tables into the operationalization of key constructs cell.
- 6.5 For each framework, paste the table 'Information relating to further development of framework'.
- 6.6 Under the cell 'Constructs with no adequate operationalizations' list all key constructs in that framework for which no adequate operationalizations could be found in the subject literature.
- 6.7 For each construct listed in the Questionnaire, select the 2nd and 3rd choice preferences as selected by the expert, copy and for each framework in which that construct is used, paste into the cells below 'Summary of operationalization' in the 'information relating to further development of framework' table. Insert details of the construct name and its preference rank in the corresponding cells.

These instructions were executed as specified with the following changes: First, because of problems with the creation of models (see stage 2 of analysis), for some framework there was no model to insert (Step 6.3). For others, the model that was inserted was considered to be uneven. Therefore explanatory comments were included in these cells.

Second, because selection among candidate operationalizations had not yet been made, instructions where included on where to insert such selections one made (6.4, 6.7).

The final set of results created here can be seen in Appendix O. Additionally, the Questionnaire on candidate operationalizations, which was also handed as a deliverable, can be seen in Appendix P.

Appendix A: Results of relevance and quality screening in First Review

Paper #	Title	Lead Author	Publicat ion Date	Qual ity revie w	Comments
Paper 1	Characterizing the nature of household vulnerability to climate variability: empirical evidence from two regions of Ghana	Antwi- Agyei	2012	Yes	Application of the sustainable livelihoods framework to direct the approach. Excellent mix of methodologies and analysis to derive final causation and determinants.
Paper 2	Assessment of climate change vulnerabilities in Kangpara Gewog, Trashigang	UNDP	2012	No	Descriptive methodology on a single project. No analytical methods to determine factors contributing toward vulnerability in the site.
Paper 3	Climate change vulnerability assessments in Miombo Woodlands. WWF.	Shumba	2012	No	Descriptive methodology, no determinants or causation laid out.
Paper 4	Assessing vulnerability of selected farming communities in the Philippines based on a behavioral model to agent's adaptation to global environmental change.	Acosta- Michlik	2008	Yes	Cited accompanying paper to justify some of the methodological approaches.
Paper 5	Assessing household vulnerability to climate change. The case of farmers in the Nile Basin of Ethiopia	Deressa	2009	Yes	Statistical analysis of agro-ecological zones and income levels as key factors determining vulnerability.
Paper 6	A Cross-Sectional, Randomized Cluster Sample Survey of Household Vulnerability to Extreme Heat among Slum Dwellers in Ahmedabad, India	Tran	2013	No	Good use of statistical regression and correlation, but outcomes were focused on heat related morbidity and effect of heat, rather than heat as one contributor to household vulnerability.
Paper 7	A method for quantifying vulnerability, applied to the agricultural system of the Yaqui Valley, Mexico	Luers	2003	Yes	Range of methods including statistical regression and spatial analysis. The paper provided a framework for assessing the relative importance of market fluctuations compared to temperature changes in determining vulnerability. Wheat yield was the outcome variable of concern in delineating vulnerability.
Paper 8	A Simple Human Vulnerability Index to Climate Change Hazards for Pakistan	Khan	2012	Yes	Range of methods and statistical approaches utilized. Outcomes showed significant factors at district level vulnerability. Robust regression to test the causation elements the authors identified.

Paper 9	Derivation of a household-level vulnerability index for empirically testing measures of adaptive capacity and vulnerability	Notenba ert	2013	Yes	Regression and correlation analysis of determinants that were used in the household vulnerability index. Good use of literature to explain the causal relationships illustrated by the statistically significant variables.
Paper 10	Who is susceptible and why? An agent-based approach to assessing vulnerability to drought	Kromker	2008	No	Range of modeling and index development, but approach was focused on susceptibility to drought and psychological response. Outcomes for India case study (fits criteria of geographic scope of systematic review) are descriptive rather than outlining key causes of vulnerability.
Paper 11	Climate vulnerability index - measure of climate change vulnerability to communities: a case of rural Lower Himalaya, India	Pandey	2012	No	Description of Composite Vulnerability Index and components between households near to the administrative headquarters and those far. Statistics carried out, but description of significant correlates and invalidated assumptions.
Paper 12	Climate variability and farmer's vulnerability in a flood-prone district of Assam	Chaliha	2011	No	Composite Vulnerability Index was derived and taken to be representative of the agricultural vulnerability of the farmers of the district with respect to floods. Indices calculated were apportioned weights according to the ranks assigned to the sources of vulnerability. This was done by the farmers based on their perceptions during the Participatory Rural Appraisal. Outcome was a weighted biophysical, agricultural, socio-economic vulnerability indices of study villages. No correlation of causation of specific indicators.
Paper 13	Climate variability and change or multiple stressors? Farmer perceptions regarding threats to livelihoods in Zimbabwe and Zambia	Mubaya	2012	Yes	Descriptive statistics and participant ranking of stressors linked to climate variability. Points allocated by participants to each stressor under a specific criterion.
Paper 14	Climate Change Impacts on Agriculture and Vulnerability as Expected Poverty of Kampong Speu Province, Cambodia	Chhinh	2012	Yes	The study aimed to identify the impact of environmental shocks (flash floods, windstorms and drought) and household characteristics on per capital income. Vulnerability indexes to predict future poverty incidence in the communities were produced.
Paper 15	Vulnerability to Weather Disasters: the Choice of Coping Strategies in Rural Uganda	Helgeson	2013	No	Focus was on analysis of coping strategies rather than vulnerability determinants.
Paper 16	Multi-Agent Modelling of Climate Outlooks and Food Security on a Community Garden Scheme in Limpopo,	Bharwani	2005	No	Investigated the effect of a climate scenario and resulting market effects, did not illustrate additional vulnerability factors

	South Africa				
Paper 17	Adaptation to climate change and variability: farmer responses to intra-seasonal precipitation trends in South Africa	Thomas	2007	No	The study analyzed and coded qualitative data for risk factors but focus was made on adaptation and coping rather than vulnerability.
Paper 18	Adapting agriculture to climate change in Kenya: Household strategies and determinants	Bryan	2013	No	Assessed determinants of adaptation versus vulnerability.
Paper 19	Analysis of vulnerability and resilience to climate change induced shocks in North Shewa, Ethiopia	Tesso	2012	Yes	Principal component analysis used to outline vulnerability factors, with relation to agro-ecological zones.
Paper 20	Application of Fuzzy Cognitive Mapping in Livelihood Vulnerability Analysis	Murungw eni	2011	No	Used three scenarios to construct fuzzy cognitive maps for livelihood analysis. Results show qualitative patterns where different vulnerability factors emerge.
Paper 21	Can farmers' adaptation to climate change be explained by socio- economic household- level variables?	Below	2012	No	Multi-linear regression model to look at factors. Focused was placed adaptation interventions
Paper 22	Community Vulnerability to Floods and Landslides in Nepal	Samir	2013	No	Assessed the relative importance of socioeconomic factors associated with differential community vulnerability to floods and landslides in Nepal. Results from regression were used by authors to describe patterns and assumptions of vulnerability
Paper 23	Effects of Landscape Segregation on Livelihood Vulnerability: Moving From Extensive Shifting Cultivation to Rotational Agriculture and Natural Forests in Northern Laos	Castella	2013	No	Developed an analytical framework for assessing the Impact of Landscape Segregation on Ecosystem Service Provision and Livelihood Vulnerability. No vulnerability determinants identified and descriptions used.
Paper 24	Food insecurity and vulnerability in Nepal: profiles of seven vulnerable groups.	Lovendal	2004	No	Workshops at national and sub-national level and focus group discussions at community scale. Descriptions of vulnerability made largely from summaries of national workshops.
Paper 25	Farmers' perception and knowledge of climate change and their coping strategies to the related hazards: Case study from Adiha, central Tigray, Ethiopia	Mengistu	2011	Yes	Hazard identification and characterization from the results of focus group discussions. Hazards were ranked by gender.
Paper 26	Farmers' perceptions of adaptation to climatechange and water stress in a South African rural community	Gandure	2013	Yes	Focus group discussions with farmers ranking factors causing changes to their livelihood including climate variability and change. Findings show age disaggregation important in ranking of hazard (e.g.

					unemployment vs. climate change for youth).
Paper 27	Farmers' vulnerability to climate variability in Dimapur district of Nagaland, India	Jamir	2013	Yes	Weights were assigned to the different indicators for obtaining the composite vulnerability index. Normalization of the values for each of the indicators was carried out. IPPC framework used to group indicators under the heads: demographic, biophysical, agricultural and socio- economic sources of vulnerability
Paper 28	Household vulnerability to climate change: Examining perceptions of households of flood risks in Georgetown and Paramaribo	Linnekam p	2011	No	Assessed direct impact of floods on households and where households took preventative action.
Paper 29	Insights into the composition of household vulnerability from multicriteria decision analysis	Eakin	2008	Yes	Development of indices based on survey data structured on livelihood capitals framework. Analytical hierarchy process applied for determining criteria weights. This was followed by compromise programming to rank households in terms of sensitivity and adaptive capacity. Fuzzy classification of households into vulnerability categories.
Paper 30	Institutional Change, Climate Risk, and Rural Vulnerability: Cases from Central Mexico	Eakin	2005	No	Livelihoods approach to explore vulnerability across three communities. Focus was on household risk management strategies.
Paper 31	Land ownership and conflicts over the use of resources: Implication for household vulnerability in eastern Ethiopia	Bogale	2006	No	Study attempts to investigate factors associated with the choice of various property right institutional arrangements for sustainable use of the land resource. Regression analysis focused on land right and property regimes.
Paper 32	Livelihood Security, Vulnerability and Resilience: A Historical Analysis of Chibuene, Southern Mozambique	Ekblom	2012	No	Historical account and more focus on ways to reduce vulnerability
Paper 33	What drives food insecurity in southern Africa? A meta-analysis of household economy studies	Misselhor n	2005	Yes	Meta-analysis of local level Household Economy Approach (HEA), citation counts of direct and indirect drivers of food insecurity as component focus of vulnerability
Paper 34	Vulnerability to individual and aggregate poverty	Calvo	2012	Yes	Axiomatic approach to the measurement of both individual and aggregate vulnerability. Constructed a vulnerability profile, based on (multivariate) correlations of household vulnerability with a set of basic characteristics, such as demographics, assets, and other general household- and village-level characteristics

Paper 35	Vulnerability to climate change in rural Ghana: mainstreaming climate change in poverty- reduction strategies	Dasgupta	2010	Yes	Constructed an index of vulnerability to climate change, at the household level. The regional risk of drought using average annual rainfall data
Paper 36	Vulnerability of smallholder rural households to food insecurity in Eastern Ethiopia	Bogale	2012	Yes	Study adapted the Vulnerability as Expected Poverty (VEP) approach to food insecurity. The study scrutinizes factors that are associated with household level vulnerability to food insecurity by adapting VEP approach.
Paper 37	A model of vulnerability to food insecurity	Capaldo	2003	Yes	Developed a forward-looking model, which identifies the risks that households are exposed to while also estimating the magnitude of the impact of these risks on household food security. The model allows the relative vulnerability to food security given each typology of households to be estimated. Vulnerability factors and correlation were identified.
Paper 38	Estimating Households Vulnerability to Idiosyncratic and Covariate Shocks: A Novel Method Applied in Madagascar	Gunther	2008	Yes	The study analyses whether vulnerability is mainly driven by permanent low consumption prospects i.e. structural or poverty-induced vulnerability or by high consumption volatility i.e. transitory or risk-induced vulnerability. The study shows covariate shocks have higher impacts on rural households.
Paper 39	Dynamics of Chronic Poverty: Variations in Factors Influencing Entry and Exit of Chronic Poor	Dhamija	2008	Yes	Used panel data from three-year blocks to assess the emergence of poverty. A regression analysis showed household size and composition, and caste to be significant in affecting poverty
Paper 40	Characterizing poverty and vulnerability in rural Haiti: a multilevel decomposition approach	Echevin	2011	Yes	Two level modeling and regression analysis of the impact of both observable and unobservable idiosyncratic and covariate shocks on household economic well being. Findings related to climate shocks and interaction with income.
Paper 41	Growth and shocks: evidence from rural Ethiopia	Dercon	2004	No	Econometric approach to test for the impact of uninsured risk. Study measured recent and past shocks which were directly introduced in regressions, and their cumulative impact quantified. (In some regressions shocks had no explicit role to play in the formulation).
Paper 42	Measuring vulnerability to poverty	Kamanou	2002	No	Capture the idea of vulnerability by starting with micro-economic theory of risk & uncertainty. The study took the changes in per capita income and consumption to signal 'shocks' like price changes or low rainfall. The idea was to generate a distribution of possible future outcomes for households based on observed characteristics. Focus was on framework development and

					methodology, no determinants clearly outlined.
Paper 43	Modelling the economic vulnerability of households in the Phang- Nga Province (Thailand) to natural disasters	Willroth	2011	No	Aimed to assess economic vulnerability of households using a questionnaire based survey and remote sensing. This was integrated into a structural equation model (SEM). Focus of analysis was vulnerability to the Tsunami and not at additional determinants of vulnerability.
Paper 44	The impact of conflict on household vulnerability to climate stress: evidence from Turkana and Kitui Districts in Kenya	Eriksen	2005	No	Investigated the impact of conflict and violence on household vulnerability to climate stress. Descriptive analysis of interview outcomes and focus was on adaptation needs.
Paper 45	The rains are disappointing us: dynamic vulnerability and adaptation to multiple sytressors in the Afram Plains, Ghana	Westerho ff	2009	Yes	Application of a generic vulnerability framework to understand community relevant exposure sensitivities. Explored four key vulnerability determinants as outcome of exposure-sensitivity analysis.
Paper 46	Typical patterns of smallholder vulnerability to weather extremes with regard to food security in the Peruvian Altiplano	Sietz	2012	Yes	Pattern analysis where vulnerability- creating mechanisms based on similarities at household level were compared. The cluster analysis examined vulnerability profiles when exposed to weather extremes, with a focus on the food security aspects of vulnerability. The cluster analysis revealed four vulnerability patterns that depict typical combinations of household attributes, including their harvest failure risk, agricultural resources, education level and non-agricultural income.
Paper 47	Factors Affecting Households Vulnerability to Climate Change in Swaziland: A Case of Mpolonjeni Area Development Programme(ADP)	Nkondze	2013	Yes	Developed a household vulnerability index based on survey results
Paper 48	Resilient or Vulnerable Livelihoods? Assessing Livelihood Dynamics and Trajectories in Rural Botswana	Sallu	2010	Yes	Quantified the impact of different livelihood trajectories. The focus was more on resilience factors, however cluster analysis split the households into varying vulnerability levels.

Paper 49	Vulnerability and poverty in Bangladesh	Azam	2009	No	The study estimates the ex ante welfare of households. Estimates were made of both the expected mean and as well as variability of consumption, with the later being determined by idiosyncratic and covariate shocks. Focus places on idiosyncratic shocks and regression didn't pinpoint specific determinants.
Paper 50	Vulnerability to Covariate and Idiosyncratic Shocks and Safety Net Targeting of Rural Households with an Application to Rural Tanzania	Sarris	2010	Yes	Household surveys, secondary data and the estimation of crop income variability were collected. In addition time series data on market prices as well as a time series on regional production and rainfall. Quantitative analysis and regressions outlined key vulnerability factors of households in both surveyed districts.
Paper 51	Vulnerability of rural households to climate change and extremes: Analysis of Chepang households in the Mid- Hills of Nepal	Piya	2012	Yes	Household survey and subsequent Principal Component Analysis for IPCC vulnerability framework. The coefficient of the trends of climate variables (rainfall and temperature) was calculated using ArcGIS and calculated separately for each household. The PCA identified vulnerability determinants under sensitivity, exposure and adaptive capacity categories.
Paper 52	Current vulnerability in the Tri-National de la Sangha landscape, Cameroon	Devissche r	2013	No	Multiple data collection methods applied to understand vulnerability under a dynamic vulnerability framework, but analysis was qualitative descriptions of the survey and community results.
Paper 53	Rural Households: Socio- Economic Characteristics, Community Organizing and Adaptation Abilities	Bruun	2013	No	Used an existing socio-economic survey to identify livelihood changes and impact of climate. Some group of vulnerability was made with specific combinations of vulnerability factors. However the method was a qualitative descriptive review based on expert opinion of the author and local knowledge.
Paper 54	Livelihood Strategies Under the Constraints of Climate Change Vulnerability in Quang Nam	Casse	2013	No	Looked at vulnerability after a disaster (typhoon) and investigated the standard deviation of income levels to determine vulnerability factors and where significant interactions may have occurred. Key factors outlined were poverty, inequality and institutional adaptation. Analysis focused on the impact of the typhoon versus general vulnerability factors
Paper 55	Perceptions of climate change, multiple stressors and livelihoods on marginal African coasts	Bunce	2010	No	Carried out rapid rural appraisals and participatory field work in Tanzania and Mozambique with a small sample to understand stressors to livelihoods. Outlined climate change as a major factor but analysis was descriptive and based on small sample and not focused on additional vulnerability determinants.

Paper 56	Natural Resource Management Impact on Vulnerability in Relation to Climate Change: A Case in a Micro-Scale Vietnamese Context	Platten- Hallermu nd	2013	No	Small household survey and interview to find out changes. Descriptive analysis of results, methodology for analysis was not clearly laid out.
Paper 57	Poverty, vulnerability and the impact of flooding in the Limpopo Province, South Africa	Khandlhe la	2006	No	Multi-dimensional approach to the analysis of vulnerability in the face of floods. Descriptive analysis of impact a specific flood had on communities and most affected assets and factors.
Paper 58	The Livelihood Vulnerability Index: A pragmatic approach to assessing risks from climate variability and change—A case study in Mozambique	Hahn	2009	Yes	Developed an LVI for two communities in Mozambique to quantify the strength of current indicators in response to current exposure to climate extremes. Determined factors that contributed to increased vulnerability.
Paper 59	Exploring vulnerability and adaptation to climate change of communities in the forest zone of Cameroon	Bele	2013	No	Assess local people's vulnerability to climate change in the humid forest zone of Cameroon in order to understand how they are affected and respond and to identify their specific needs for adaptation. Analysis was through descriptions and focus was on climate factors and impact on livelihoods.
Paper 60	Vulnerability Assessment of Weather Disasters in Syangja District, Nepal: A Case Study in Putalibazaar Municipality	Shrestha	2005	No	This assessment includes analysis of current vulnerability as the quantitative integration of physical and socio- economical vulnerability, analysis of existing qualitative adaptive capacity and identification of adaptive measures in reducing the vulnerability. The analysis was descriptive and focused on potential coping mechanisms.
Paper 61	Spatial vulnerability assessments of rural households to climate change in Nigeria: Towards evidence-based adaptation policies	Madu	2012	No	Assessed district level vulnerability comparing urban and rural areas of Nigeria. Performed cluster analysis and identified determinants of each level of vulnerability. Focus was on adaptive actions and policy needs.
Paper 62	Climate Change and Vulnerability to Food Insecurity among Smallholder Farmers: A Case Study of Gweru and Lupane Districts in Zimbabwe	Mtswang wa	2011	Yes	This study assesses the vulnerability of smallholder farmers in two districts of Zimbabwe by assessing the likelihood of individual households being food insecure. The study assesses how households' own production levels interact with household characteristic. Regression carried out to determine significant factors with cereal production.
Paper 63	Measuring Household Food Vulnerability: Case Evidence from Northern Mali	Christiae nsen	2000	No	Develop a methodology to analyze and measure household food vulnerability, defined as the probability now of caloric shortfall in the future.

Paper 64	Measuring Vulnerability and Poverty Estimates for Rural India	Gaiha	2008	No	Assessment of the vulnerability of rural households using panel data was made with ex ante and ex post measures of vulnerability calculated using poverty based vulnerability framework and econometric methods. Aggregate idiosyncratic and poverty components were calculated.
Paper 65	The Impact of Drought on Household Vulnerability: The Case of Rural Malawi	Makoka	2008	No	Econometric approach to analyzing household vulnerability. Methods were descriptive and not analytical.
Paper 66	Quantifying Vulnerability to Poverty: A Proposed Measure, with Application to Indonesia	Pritchett	2000	No	Quantified vulnerability to poverty. The outcomes, although quantified by the econometric model didn't show a clear methodological approach to differentiate determinants beyond the two data sets used.
Paper 67	Vulnerability assessment if the climate risks in the lower Songkhram River Basin,Thailand	UNDP	2007	No	No evaluation methodology applied and results were descriptive.
Paper 68	Village vulnerability assessment and climate change adaptation planning (V&A) Mlingotini & Kitonga, Bagamoyo district, Tanzania	Tobey	2011	No	Range of data collection but descriptive analysis of results.
Paper 69	Farmer Vulnerability Amidst Climate Variability: A case study of Dry Zone of Myanmar	Куі	2012	No	Did not utilize data collection / secondary sources of data or an applied set of methods to describe vulnerability outcomes.
Paper 70	Climate change impacts on livelihood, vulnerability and coping mechanisms. A case study of West-Arsi Zone, Ethiopia.	Senbeta	2009	No	Vulnerability groupings were made with no clear empirical rationale.
Paper 71	Stakeholders' views in reducing rural vulnerability to natural disasters in Southern Mexico: Hazard exposure and coping and adaptive capacity	Saldana- Zorilla	2008	No	Multiple methods of data collection, but analysis was focused on coping responses and methods to reduce vulnerability, rather than the determinants in the surveyed communities.

Appendix B: Email sent to vulnerability experts

Climate vulnerability review project

Tue, Jul 22, 2014 at 2:55 PM

As part of its work in the Climate Change, Agriculture and Food Security programme (ccafs.org), the International Livestock Research Institute (www.ilri.org) is conducting a systematic review of research on local level vulnerability to climate variability in rural communities. The purpose of our study is to identify best practices for tracking changes in climate vulnerability, the results of which will serve as an important input for the CCAFS programme over the coming years. However, our study will only be as good as the publications we review. We have thus far conducted systematic searches of research databases for empirical articles measuring climate vulnerability (resulting in over 300 articles) and screened them for their precision and transparency in any one or a mix of the following aspects: conceptualization, operationalization, empirical measurement and analysis.

Within our systematic review approach, we would like help from you, as an expert in the field, to make sure that we include a) all significant frameworks for the study of local vulnerability to climate change, and b) to make sure that we review an ideal mix of examples of empirical cases within each of these frameworks. Within each framework, we expect that papers will not present all aspects equally well. As such, we intend to synthesize across papers within each model. To support our synthesis, we need a mix of papers, each of which is excellent in one or several aspects of studying climate vulnerability (conceptualization, operationalization, empirical measurement and analysis).

The attachment to this email contains a preliminary distillation and analysis of materials we have gathered so far. In the interest of cross-checking our work to ensure that we have not overlooked any important papers or models, we would like to ask that you review the attachment with an eye toward the following questions:

1. Are there additional models that we have missed? If yes,

a. what article(s) best describe the model

b. what articles are the best examples of its operationalization

2. Are there strong*papers* that should be substituted for, or added to, those we have listed with each of the models we have identified?

We will appreciate any suggestions you contribute to refine and strengthening our list. Please provide a brief justification for any suggested additions or substitutions, and do not be shy about indicating your own work where appropriate. Examples from both academic and grey literature are welcome.

You are undoubtedly very busy over the coming weeks, but we would appreciate receiving your response by September 1, so that we can proceed with our analyses in a timely fashion.

Do not hesitate to contact me with any questions or concerns you may have regarding our project. We look forward to receiving your input.

Best wishes,

Livestock Systems and Environment

International Livestock Research Institute

Nairobi, Kenya

Climate vulnerability framekworks.docx 32K

Attachment:

Seven frameworks for the study of local level climate vulnerability and good examples thereof

Framework: IPCC and adaptations at Household level

Description: This framework looks at vulnerability as conceived by IPCC (2001; 2007) or Fussel (2007), or adaptations of these approaches, and is operationalised on a household level.

The IPCC framework identifies three dimensions of vulnerability:

- Exposure to climate-change induced shocks or hazards
- Sensitivity to climate-change induced shocks or hazards
- Adaptive Capacity the capacity to adapt to or mitigate the effects of climate change induced shocks or hazards

The framework seeks to identify which determinants have the greatest impact on household vulnerability, as defined above.

Best Example: Luers et al (2003) A method for quantifying vulnerability, applied to the agricultural system of the Yaqui Valley, Mexico. *Global Environmental Change* 13: 255–267

Description of example: This paper presents a methodology which is then applied to a case study of an agricultural system in Mexico. It is an early example of an attempt to create a comprehensive methodology around the IPCC framework. The methodology measures the vulnerability of a variable of concern (in this case wheat yields) to stressors (climate change or market shocks) as a function of exposure and sensitivity indicators. Vulnerability score is however countered by measures for adaptive capacity, which is the major contribution of this paper.

Other examples:

Tesso, Gutu, Bezabih Emana, and Mengistu Ketema

2012 Analysis of Vulnerability and Resilience to Climate Change Induced Shocks in North Shewa, Ethiopia. Agricultural Sciences 3(6): 871–888.

Westerhoff, Lisa, and Barry Smit

2009 The Rains Are Disappointing Us: Dynamic Vulnerability and Adaptation to Multiple Stressors in the Afram Plains, Ghana. Mitigation and Adaptation Strategies for Global Change 14(4): 317–337.

Supporting literature:

IPCC

2001 Climate Change 2001: Impacts, Adaptation, and Vulnerability. Third Assessment Report of the IPCC. UK: University Press, Cambridge.

2007 Climate Change 2007: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Third Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge, UK: Cambridge University Press.

Füssel, Hans-Martin
2007 Vulnerability: A Generally Applicable Conceptual Framework for Climate Change Research. Global
Environmental Change 17: 155–167.

Framework: IPCC and adaptations at local level

Description: This framework is defined similarly to that above, but is operationalised at a village level. The framework is used to make comparisons between villages in terms of what factors impact on vulnerability and identify any locality-specific factors.

Best Example: Jamir et al (2013) Farmers' vulnerability to climate variability in Dimapur district of Nagaland, India. *Regional Environmental Change* 13(1): 153-164

Description of example: This paper constructs an indicator-based model of vulnerability, based on the three IPCC dimensions of exposure, sensitivity, and adaptive capacity, to examine farmers' vulnerability to climate-induced stress, in this case to drought. The research uses a combination of household surveys, participatory rural appraisals, and secondary data to examine the contribution of a set of factors categorised as biophysical, agricultural, demographic, and socio-economic, to farmers' vulnerability. Households in five villages in Nagaland in India are surveyed, and these villages are then ranked according to village-level vulnerability scores.

Other examples

Antwi-Agyei, Philip, Andrew J. Dougill, Evan D. G. Fraser, and Lindsay C. Stringer

2013 Characterising the Nature of Household Vulnerability to Climate Variability: Empirical Evidence from Two Regions of Ghana. Environment, Development and Sustainability 15(4): 903–926.

Hahn, Micah B., Anne Riederer, and Stanley Foster

2009 The Livelihood Vulnerability Index: A Pragmatic Approach to Assessing Risks from Climate Variability and change—A Case Study in Mozambique. Global Environmental Change 19: 74–88. Supporting literature:

IPCC

2001 Climate Change 2001: Impacts, Adaptation, and Vulnerability. Third Assessment Report of the IPCC. UK: University Press, Cambridge.

2007 Climate Change 2007: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Third Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge, UK: Cambridge University Press.

Füssel, Hans-Martin

2007 Vulnerability: A Generally Applicable Conceptual Framework for Climate Change Research. Global Environmental Change 17: 155–167.

Framework: Vulnerability as Expected Poverty (and adaptations) at Household level

Description: This framework looks at Vulnerability as Expected Poverty (VEP), as developed by Chaudhuri et al (2002); Christiaensen & Subbarao (2005), or adaptations of these approaches, and is operationalised on a household level.

Household Vulnerability as Expected Poverty is defined as the probability of household income or

consumption falling below a defined poverty line given risks of shocks. A household is considered vulnerable if this probability is below a given threshold (e.g. 0.5).

The framework seeks to identify which determinants have the greatest impact on the probability of falling into, or remaining in, poverty.

Best Example: Sarris & Karfakis (2010) Vulnerability to Covariate and Idiosyncratic Shocks and Safety Net Targeting of Rural Households with an Application to Rural Tanzania. *Conference Paper*. <u>http://erd.eui.eu/media/2010/Sarris.pdf</u>.

Description of example: This research takes the Vulnerability as Expected Poverty framework and defines

poverty in terms of consumption. The effects on vulnerability of idiosyncratic shocks and covariate shocks are estimated. The framework is applied to a data set of household survey data from rural smallholder farms in Tanzania.

Supporting literature

Chaudhuri, S., J. Jalan, and A. Sryahadi

2002 Assessing Household Vulnerability to Poverty from Cross-sectional Data: A Methodology and Estimates from Indonesia. Columbia University, Department of Economics Discussion Paper Series 0102(52).

Christiaensen, Luc J., and Kalanidhi Subbarao 2005 Towards an Understanding of Household Vulnerability in Rural Kenya. JOURNAL OF AFRICAN ECONOMIES 14(4): 520–558.

Framework: Vulnerability as Expected Poverty at household and local level

Description: This is defined similarly to above but is operationalised at more than just household level. It is used to compare across villages, sometimes in different climatic zones.

Best Example: Echevin, Damien (2014) Characterizing Vulnerability to Poverty in Rural Haiti. *Journal of Agricultural Economics* 65(1): 131–150.

Description of example: This article uses the Vulnerability as Expected Poverty model, as developed by Chaudhuri et al (2002) and Christiaensen & Subbarao (2005), with poverty defined both by consumption and by income. This model is operationalised at both a household and community level. Data is based on household surveys which gather quantitative information on socio-economic indicators and qualitative information on perceived shocks and coping strategies, which together provides a cross-section of current poverty levels. This data is then analysed according to VEP econometric models to arrive at probabilities of future levels of poverty, and to identify how these probability levels are impacted by different forms of shocks (idiosyncratic or covariate).

Other examples

Günther, Isabel, and Kenneth Harttgen

2009 Estimating Households Vulnerability to Idiosyncratic and Covariate Shocks: A Novel Method Applied in Madagascar. World Development 37(7): 1222–1234.

Nkondze, Majahodvwa S., Micah B. Masuku, and Absalom Manyatsi

2013 Factors Affecting Households Vulnerability to Climate Change in Swaziland: A Case of Mpolonjeni Area Development Programme (ADP). Journal of Agricultural Science 5(10): p108.

Supporting literature

Chaudhuri, S., J. Jalan, and A. Sryahadi

2002 Assessing Household Vulnerability to Poverty from Cross-sectional Data: A Methodology and Estimates from Indonesia. Columbia University, Department of Economics Discussion Paper Series 0102(52).

Christiaensen, Luc J., and Kalanidhi Subbarao 2005 Towards an Understanding of Household Vulnerability in Rural Kenya. JOURNAL OF AFRICAN ECONOMIES 14(4): 520–558.

Framework: Food insecurity

Description: This framework takes a conception of food security from the FAO (2013) or Lovedal & Knowles (2006) and adapts them to focus on vulnerability, usually through a combination with either the IPCC

framework or the VEP framework.

Food security is defined as having four dimensions:

- Availability or production of food
- Access to food
- Stability of availability or access
- Utilisation of available and accessible food.

Best Example: Capaldo et al (2010) A model of vulnerability to food insecurity. *ESA Working paper*. 10(3). http://bvsan.uni.edu.ni:8080/48/1/model_vulnerability.pdf.

Description of example: This study used a conceptual framework of food insecurity (with four dimensions: availability; access; consumption; utilization, following Lovendal-Knowles 2006) which is combined with an adaptation of the Vulnerability as Expected Poverty econometric model, to create a 'Vulnerability as Expected Food insecurity' framework. This is applied to data collected from households in Nicaragua to determine the impact of a set of socio-economic household variables on expected food insecurity. **Other examples**

Sietz, Diana, Sabino Edgar Mamani Choque, and Matthias K. B. Lüdeke

2012 Typical Patterns of Smallholder Vulnerability to Weather Extremes with Regard to Food Security in the Peruvian Altiplano. Regional Environmental Change 12(3): 489–505. Mutsvangwa, Eness P.

2011 Climate Change and Vulnerability to Food Insecurity among Smallholder Farmers: A Case Study of Gweru and Lupane Districts in Zimbabwe. University of Free State Bloemfontein. http://etd.uovs.ac.za/ETD-db/theses/available/etd-08182011-105132/unrestricted/MutsvangwaEP.pdf.

Supporting literature

FAO, IFAD, and WFP

2013 The State of Food Insecurity in the World 2013: The Multiple Dimensions of Food Security. Rome. http://www.fao.org/docrep/018/i3434e/i3434e.pdf.

Lovendal, Christian Romer, and Marco Knowles

2006 Tomorrow's Hunger: A Framework for Analysing Vulnerability to Food Security. Research Paper, UNU-WIDER, United Nations University (UNU) 2006(119).

Framework: Sustainable livelihoods

Description: This framework takes a livelihoods framework, based on theorists such as Chambers and Conway (1992), Scoones (1998), and Sen (1981) and converts such a framework to deal with the concept of vulnerability to climate-change-induced shocks or risks. In the livelihoods approach household livelihoods are defined as a function of access to five forms of capital (natural, social, financial, physical, human), and strategies of utilising these assets. Such a framework is adapted to study vulnerability usually through using a vulnerability framework such as IPCC (2001), or VEP (Chaudhuri et al 2002), or Fraser et al 2010 in order to categorise or structure data generated through the livelihoods approach.

Best Example: Hahn, M.B., et al., The Livelihood Vulnerability Index: A pragmatic approach to assessing risks from climate variability and change—A case study in Mozambique. Global Environ. Change (2009). doi:10.1016/j.gloenvcha.2008.11.002

Description of example: This study uses a framework derived from classifying the indicators Sustainable Livelihoods Approach according to the three dimensions of the IPCC's concept of vulnerability to climate change variability (exposure, sensitivity, adaptive capacity). Data is collected through household surveys, which is then aggregated up to create village-level vulnerability scores for two villages. Conclusions are drawn as to which sources of vulnerability are most relevant in either village.

Other examples

Sallu, Susannah, Chasca Twyman, and Lindsay C. Stringer

2010 Resilient or Vulnerable Livelihoods? Assessing Livelihood Dynamics and Trajectories in Rural Botswana. Ecology and Society 15(4): 3.

Antwi-Agyei, Philip, Andrew J. Dougill, Evan D. G. Fraser, and Lindsay C. Stringer

2013 Characterising the Nature of Household Vulnerability to Climate Variability: Empirical Evidence from Two Regions of Ghana. Environment, Development and Sustainability 15(4): 903–926.

Supporting literature

Chambers, R., and G. Conway

1992 Sustainable Rural Livelihoods: Practical Concepts for the 21st Century. IDS Discussion Paper 296.

Chaudhuri, S., J. Jalan, and A. Sryahadi

2002 Assessing Household Vulnerability to Poverty from Crosssectional Data: A Methodology and Estimates from Indonesia. Columbia University, Department of Economics Discussion Paper Series 0102(52). Fraser, Evan D. G., Andrew J. Dougill, Klaus Hubacek, et al.

2010 Assessing Vulnerability to Climate Change in Dryland Livelihood Systems: Conceptual Challenges and Interdisciplinary Solutions. Ecology and Society 16(3): 3.

IPCC

2001 Climate Change 2001: Impacts, Adaptation, and Vulnerability. Third Assessment Report of the IPCC. UK: University Press, Cambridge.

Scoones, Ian

1998 Sustainable Rural Livelihoods: A Framework for Analysis. Brighton, UK: Institute of Development Studies.

Sen, Amartya

1981 Poverty and Famines: An Essay on Entitlement and Deprivation. Oxford, UK: Clarendon Press.

Framework: Resilience

Description: There does not appear to be much consensus on how resilience is conceptualised. Different theories have been cited (eg DFID; Fraser et a 2010) and variously refers to either the capacity to withstand shocks, and/or the recovery after being hit by shocks.

In terms of withstanding shocks, this can be operationalized at household, community, or agro ecological system level and is measured according to the size of the shock – i.e. the greater the shock withstood, the greater the resilience of the community/household/agro system.

In terms of recovery, this refers to how long it takes a household/community/agro ecological system to return to its pre-shock state.

Best Example: Tesso et al (2012) Analysis of vulnerability and resilience to climate change induced shocks in North Shewa, Ethiopia. *Agricultural Sciences* 3 (2012) 871-888.

Description of example: A framework largely derived from the IPCC (2001) is used to survey rural farm households in Ethiopia. A combination of socio-economic and bio-physical indicators are combined and classified into the three categories of exposure, sensitivity and adaptive capacity. This framework is extended to include a 'resilience' component, which is defined in terms of how long it takes a household to return to a pre-shock operating state (building on DFID). The data is used to create a vulnerability index for each agro ecological zone in the study.

Other examples: None found of sufficient quality.

Supporting literature

Department for International Development

2013 Defining Disaster Resilience: A DFID Approach Paper. UK.

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/186874/defining-disasterresilience-approach-paper.pdf.

Fraser, Evan D. G., Andrew J. Dougill, Klaus Hubacek, et al.

2010 Assessing Vulnerability to Climate Change in Dryland Livelihood Systems: Conceptual Challenges and Interdisciplinary Solutions. Ecology and Society 16(3): 3.

IPCC

2001 Climate Change 2001: Impacts, Adaptation, and Vulnerability. Third Assessment Report of the IPCC. UK: University Press, Cambridge.

Appendix C: Article-specific construct tables

Article: (Antw			1	1	Ι
<u>Construct</u>	Defined?	Definition or further info	<u>Directly</u>	Indirectly	Operational text
			Operationalized?	operationalized	
				<u>through:</u>	
Access to	Yes	"Traditionally, the SLA has been	Yes/no/ not	[name of	
livelihood		applied by considering the five	operationalized	construct]	
capital		livelihood capital assets—human,			
assets		financial, natural, physical and			
		social—as well as their links to an			
		overall vulnerability context,			
		processes, institutions (both formal			
		and informal) and poli- cies that			
		govern people's access to these			
		capital assets (Scoones 1998)."			
		(Antwi-Agyei et al. 2013, 909)			
Adaptive	Yes	Adaptive capacity in the context of	No	Livelihoods	
capacity		climate change has been defined			
		by the IPCC (2007, p. 869)as ''the			
		ability of a system to adjust to			
		climate change (including climate			
		variability and extremes) to			
		moderate potential damages, to			
		take advantage of opportunities, or			
		to cope with the consequences."			
		Adaptive capacity connotes some			
		positive attributes of a system that			
		enable it to reduce the adverse			
		impacts (vulnerability) associated			
		with climate change (Engle 2011).			
		(Antwi-Agyei et al. 2013, 905)			
Climatic risk	Yes	a specific climatic risk (Vincent	Not		
		2007),	operationalized		
		which in the case of this paper, is			

		drought		
		(Antwi-Agyei et al. 2013, 905)		
Community	Yes	Nevertheless, households are	Yes	communities were Aframso, Babaso and
		connected to the wider		Nyamebekyere located in the Ejura
		community, which can greatly		Sekyere- dumasi district of Ashanti
		influence the decision-making		region, while vulnerable communities
		process in relation to the use of		were Adaboya, Ayelbia and Vea located
		pro- ductive resources of a		in the Bongo district in the Upper East
		particular household; hence, the		region (Fig. 1; Antwi-Agyei et al.
		need to explore vulnerability and		(Antwi-Agyei et al. 2013, 907)
		adaptation strategies at the		
		household level in relation to the		
		wider socioeconomic and cultural		
		processes occurring at the		
		community level (Thomas et al.		
		2007).		
		(Antwi-Agyei et al. 2013, 905)		
Diversified	Yes	ortant because diversification has	Yes	Therefore, the number of livelihood
livelihood		been reported as one of the main		activities that a household was engaged
activities		strategies for reducing household		in was also assessed. It is assumed that
		vulnerability to the impacts of		households with more diversified
		climate change and variability (see		livelihood sources may be less
		Ellis 1998; Barrett et al. 2001).		vulnerable to the impacts of climate
		Therefore, the number of		change compared to households that
		livelihood activities that a		depend only on agriculture. The
		household was engaged in was also		livelihood approach argues that agricul-
		assessed. It is assumed that		ture-dependent households may be able
		households with more diversified		to reduce their overall vulnerability to
		livelihood sources may be less		climate variability by diversifying the
		vulnerable to the impacts of		strategies pursued within their
		climate change compared to		livelihood portfolios or specialising to
		households that depend only on		take advantage of a niche (see Ellis
		agriculture. The livelihood		1998; Bebbington 1999; Fraser et al.
		approach argues that agricul- ture-		2005). Hence, the livelihood
		dependent households may be able		vulnerability index is estimated to be
		to reduce their overall vulnerability		directly proportional to the number of
		to climate variability by diversifying		livelihood activities in which a
		the strategies pursued within their		household engages. A score of 1 was

Drought	No	livelihood portfolios or specialising to take advantage of a niche (see Ellis 1998; Bebbington 1999; Fraser et al. 2005). Hence, th (Antwi-Agyei et al. 2013, 912)		therefore given to households that had only one livelihood activity, 2 for households having two livelihood activities, 3 for those with three livelihood activities, 4 for those with four livelihood activities, and households with[4 livelihood activities scored 5. (Antwi-Agyei et al. 2013, 912)
Exposure	Yes	Exposure relates to the extent to which a particular system may be exposed to climatic stresses or variations (IPCC 2007). (Antwi-Agyei et al. 2013, 905)	Yes	In this regard, it is assumed that households within the same agroecological zone may be exposed to the same level of climate anomaly (drought in this case) (Eakin and Bojorquez-Tapia 2008). (Antwi-Agyei et al. 2013, 905)
Financial capital	Yes	Financial capital assets such as savings and remittances play a crucial role in cushioning households against drought-related food shortages. Eliciting information on financial assets was very problematic because of a lack of records on sales and memory lapses. Livestock were considered to offer readily available cash in times of crop failure due to erratic rainfall patterns in the study communities. (Antwi-Agyei et al. 2013, 911)	Yes	Financial capital assets such as savings and remittances play a crucial role in cushioning households against drought- related food shortages. Eliciting information on financial assets was very problematic because of a lack of records on sales and memory lapses. Livestock were considered to offer readily available cash in times of crop failure due to erratic rainfall patterns in the study communities. Indeed, Hesselberg and Yaro (2006) argue that a peasant household's ability to obtain food in northern Ghana, especially in the lean season, largely depends on the availability of disposable livestock and poultry. Households without poultry or livestock scored 1 whilst those with livestock scored 2. In addition, financial assets were assessed by examining the remittances received by the household

					from family members or friends over the past 12 months. In rural agriculture- dependent communities, remittances from family and friends play a crucial role in helping farmers to cope with the livelihood impacts resulting from climate variability. Households that received remittances in the last 12 months scored 2 and those that did not receive any remittances scored 1. Access to credit may also influence adaptation to climate change including access to inputs such as improved cultivars of crops (e.g. Butt et al. 2006; Fosu-Mensah et al. 2012). Hence, it is assumed that households that have no access to credit will be more vulnerable and scored 1 whilst those with access to credit were given a score of 2. (Antwi-Agyei et al. 2013, 911)
Household	Yes	The household was selected as the main unit of analysis because major decisions about adaptation to climate change and livelihood processes are taken at the household level (Thomas et al. 2007). (Antwi-Agyei et al. 2013, 905)	No	Community	
Human Capital	Yes	Human capital assets were represented by two indicators: the educational level of the head of the household (or the most educated person in the household) and the health status of the household (Table 1). (Antwi-Agyei et al. 2013, 910)	Yes		Human capital assets were represented by two indicators: the educational level of the head of the household (or the most educated person in the household) and the health status of the household (Table 1). No formal education was afforded a value of 1; 2 in the case of only primary education; 3 in the case of secondary education; and 4 for households that had tertiary education.

					As there is a link between health and climate change (Haines et al. 2006), it is assumed that households with significant health problems will have lower human capital as they must allocate a substantial part of their scarce resources to treating illnesses (e.g. Allison et al. 2009), thereby reducing their capacity to withstand the impacts of climate variability. To assess health status, households were asked about the number of times they have been to the hospital (or hospitalised) within the last 12 months. House- holds with members that had been to the hospital were scored 1 whilst those with members that had not been to hospital as out patients (and those not needing any medical attention) within this period were scored 2. Also, situations where members of a household required hospital treatment but could not arrange transport and other resources needed were taken into consideration when scoring such a household. (Antwi-Agyei et al. 2013, 910)
Livelihood capital assets	Yes	Traditionally, the SLA has been applied by considering the five livelihood capital assets—human, financial, natural, physical and social— (Antwi-Agyei et al. 2013, 909)	No	Social capital; financial capital; natural capital; physical capital; human capital	
Livelihoods	Yes	Traditionally, the SLA has been applied by considering the five livelihood capital assets—human, financial, natural, physical and social—as well as their links to an	No	Livelihood capital assets	

		overall vulnerability context,		
		processes, institutions (both formal		
		and informal) and poli- cies that		
		govern people's access to these		
		capital assets (Scoones 1998).		
		(Antwi-Agyei et al. 2013, 909)		
Natural	Yes	Natural capital assets were	Yes	Natural capital assets were assessed by
capital		assessed by two indicators. The		two indicators. The first was the size of
		first was the size of the farm		the farm holding under cultivation (this
		holding under cultivation		was estimated as the average area of
		scored 3; those cultivating 16-20		cultivated land over the past 5 years)
		acres scored 4, and households		(Table 1). It is assumed that the larger
		cultivating [20 acres scored 5. T		the farm holding, the greater the
		(Antwi-Agyei et al. 2013, 910)		opportunity for the household to have
				more crops and yield, and hence the
				lower the vulnerability to climate
				change, though it is noted that labour
				availability and financial capital both
				affect the reality of how much land can
				be cultivated. Households which
				cultivated less than 5 acres scored 1;
				those cultivating between 5 and 10
				acres scored 2; those cultivating
				between 11 and 15 acres scored 3;
				those cultivating 16-20 acres scored 4,
				and households cultivating [20 acres
				scored 5. The type of land tenure and
				level of security it provides may have
				serious implications for the
				management of agricultural soils and
				could indirectly affect crop productivity
				and environmental sustainability, conse-
				quently influencing household
				vulnerability (Butt et al. 2006). Three
				different tenure arrangements were
				identified in the study communities.
				These were "land inherited", "land
				purchased" and "land rented" by the

				household. A score of 1 was given to households who rented their farmlands; 2 for households who purchased their farmlands; and 3 for those who inherited their farmlands. Households that inherited their farm lands were given the highest score because it is assumed that they will have the most secure land tenure. (Antwi-Agyei et al. 2013, 910)
Physical capital	Yes	Physical assets that were assessed included the presence of irrigation facilities and own- ership of radios, television or mobile phones by a household (Table 1). (Antwi-Agyei et al. 2013, 911)	Yes	Physical assets that were assessed included the presence of irrigation facilities and own- ership of radios, television or mobile phones by a household (Table 1). Irrigation facilities are crucial for rain-fed agriculture- dependent households, as these facilities help farmers to practise dry season farming. It is assumed that households with irrigation facilities will be less vulnerable to changing rainfall patterns. Hence, households without irrigation facilities scored 1, whilst those with these facilities scored 2. The presence of radios, television or mobile phone in a rural household can be an effective tool for communication and accessing information on changing weather patterns (see Naab and Koranteng 2012). Here, households with any of these three assets scored 2, and those without any scored 1. Physical assets such as road networks and the availability of markets and health facilities may enhance the adaptive capacity of a household (see Zhang et al. 2007). These assets were not included in the vulnerability computation because

					field observations suggested that these physical assets did not significantly differ amongst either the resilient or vul- nerable communities. (Antwi-Agyei et al. 2013, 911)
Resilience	Yes	Consideration of resilience in this paper provides the opportunity to explore livelihood dynamics in order to understand the capacity of a particular system to withstand the adverse impacts of climate variability (Marschke and Berkes 2006). (Antwi-Agyei et al. 2013, 905)	No	Livelihoods	
Resilient and vulnerable communitie s	Yes	was based on a definition of "vulnerable" regions and districts as those where relatively minor perturbations in rainfall over the past 40 years had significant impacts on crop yields (Antwi- Agyei et al. 2012). Conversely, "resilient" regions and districts were defined as those where even large droughts were observed to have had only minor impacts on crop yields (Simelton e (Antwi-Agyei et al. 2013, 906)	Yes		communities were Aframso, Babaso and Nyamebekyere located in the Ejura Sekyere- dumasi district of Ashanti region, while vulnerable communities were Adaboya, Ayelbia and Vea located in the Bongo district in the Upper East region (Fig. 1; Antwi-Agyei et al. 2012). (Antwi-Agyei et al. 2013, 907)
Resilient and vulnerable households	No				
Sensitivity	Yes	sensitivity determines the response of a given system to climate change and may be shaped by socioeconomic and ecological conditions of the system (IPCC 2007). (Antwi-Agyei et al. 2013, 905)	No	Livelihoods	

Social capital	Yes	Social capital—including connections to technical support and social resources such as networks, associations and affiliations—was assessed by counting the number of associations or groups to which the members of the household belong (Antwi-Agyei et al. 2013, 909)	Yes		A scoring procedure for social capital followed the methods of Vincent (2007). A score of 1 was given to households that belonged to no identifiable group, 2 for those who were members of one group, 3 for membership of two groups and 4 for membership of more than three groups. (Antwi-Agyei et al. 2013, 910)
Socio- economic, environmen tal, and community characteristi cs	No				
Vulnerabilit Y	Yes	Nevertheless, the most commonly accepted approach, which is the approach adopted in this paper, comes from the Intergovernmental Panel on Climate Change (IPCC)'s definition of vulnerability (to climate change) where vulnerability is "the degree to which an environmental or social system is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes" (Antwi-Agyei et al. 2013, 904)	No	Access to livelihood capitals; diversified livelihood activities; exposure; sensitivity	

Article: (Baca et al. 2014)							
<u>Construct</u>	Defined?	<u>Definition or further info</u>	Directly Operationalized?	Indirectly operationalized through:	Operational text		
Adaptation strategies	No		Yes/no/ not operationalized	[name of construct]			

Adaptive capacity	In contrast, adaptive capacity is defined as a system's ability to adjust to climate change in order to reduce or mitigate possible damage [3]. Adaptive capacity is dynamic, and depends partly on the society productive base, such as: natural and artificial assets, social benefits and networks, human capital and institutions, governance, national income, health and technology [2], and how much capability a society has to adapt to the changes so as to maintain, minimize loss of, or maximize gain in welfare. (Baca et al. 2014, 2)	Yes	Indicators of the sensitivity to climate change and adaptive capacity were devised in collaboration with organizations and experts from the region using an expert panel, focus groups, and semi-structured interviews. For the expert panel, semi-structured individual interviews were conducted with 17 key informants of the coffee sector in Nicaragua, including technicians, farmers and researchers. It included questions about the most important factors affecting coffee production. Four focus groups were carried out in Nicaragua and three groups in each of the remaining countries (El Salvador, Guatemala and Mexico). Participants discussed and assessed the significance of climate change over time and identified key indicators for coffee
Exposure	Exposure is the nature and extent of changes that a place's climate is subjected to with regard to variables such as temperature, precipitation, and extreme weather events. (Baca et al. 2014, 2)	Yes	livelihoods. The list of key indicators for conee livelihoods. The list of key indicators was structured according to the five community capitals (natural, human, social, physical and financial) of the Livelihoods Approach [1]. (Baca et al. 2014, 3) Exposure To quantify exposure to climate change, crop suitability models predicting future changes of climatic suitability of coffee were used for the four countries. The methodology combined current climate data with future climate change predictions. To map current climatic suitability, the historical climate database WorldClim (www.worldclim.org) was used. The variables included a total of 19 bioclimatic variables derived from (Baca et al. 2014, 3)
Sensitivity	Sensitivity is a measure of how systems	Yes	Indicators of the sensitivity to climate

	could be affected by the change in climate (e.g. how much crop yields change or how much human health might be affected). (Baca et al. 2014, 2)			change and adaptive capacity were devised in collaboration with organizations and experts from the region using an expert panel, focus groups, and semi-structured interviews. For the expert panel, semi-structured individual interviews were conducted with 17 key informants of the coffee sector in Nicaragua, including technicians, farmers and researchers. It included questions about the most important factors affecting coffee production. Four focus groups were carried out in Nicaragua and three groups in each of the remaining countries (El Salvador, Guatemala and Mexico). Participants discussed and assessed the significance of climate change over time and identified key indicators for coffee livelihoods. The list of key indicators was structured according to the five community capitals (natural, human, social, physical and financial) of the Livelihoods Approach [1]. (Baca et al. 2014, 3)
Vulnerability of coffee farming communities	For our methodology, vulnerability is defined as changes in climate variables that affect agricultural and natural systems over a timeframe. The vulnerability in the livelihoods of small coffee farmers is a function of three factors: exposure, sensitivity and adaptive capacity. (Baca et al. 2014, 2, 3)	No	Exposure; sensitivity; adaptive capacity	

Construct	Defined?	Definition or further info	Directly Operationalized?	Indirectly operationalized through:	Operational text
Adaptive capacity	Yes/no	Adaptive capacity is the capacity of actors in a system to influence resilience (Folke et al. 2010), and often works through social networks and learning communi- ties (Goldstein 2012). [] We view adaptive capacity as a latent pro- perty, which can be activated when people exercise their agency. The processes by which this occurs have not been well explored. (Berkes and Ross 2013, 15)	not operationalized		
Agency	No				
Community resilience		Community resilience as a function of the strengths or characteristics that have been identified as important, leading to agency and self-organization. (Berkes and Ross 2013) 14 (Berkes and Ross 2013, 14)	not operationalized		
Self-organizing	No				

Article: (Bogale, Taeb, and Endo 2006)							
<u>Construct</u>	Defined?	Definition or further info	<u>Directly</u>	Indirectly operationalized	Operational text		
			Operationalized?	<u>through:</u>			
Common	No		Yes/no/ not	[name of construct]			
property			operationalized				
Household	No						
choice							
Private property	No						

Property rights	Yes	Property rights can be defined as bthe capacity to call upon the collective stand behind one's claim to a benefit stream (Bromley, 1991).Q Thus, property rights involve a relationship between the right holder, others, and an institution to back up the claim (Bogale, Taeb, and Endo 2006, 136)	Not operationalized	
Property rights regime	Yes	Property rights over land and other natural resources are often broadly classified as public, com- mon, and private or blegal individualsQ such as com- panies. (Bogale, Taeb, and Endo 2006, 136)	Not operationalized	
Public property	No			
Vulnerability	No			

Article: (Calvo and	Article: (Calvo and Dercon 2013)							
<u>Construct</u>	Defined?	Definition or further info	Directly	Indirectly	Operational text			
			Operationalized?	operationalized				
				<u>through:</u>				
Aggregate	Yes	Theorem 2 F satisfies SOS, D, SI,	No	Individual				
vulnerability		SDEO, PTe, N, CRRSe, SCO, SOI and		vulnerability				
		RI if and only if						
		F (z,p,Y) = 🛛 1						
		? ?1–E						
		23						
		2 n						
		⑦ i=1						
		xi						
		1 n						
		???? ?????????????????????????????????						

		 ☑ ☑, with☑<0 or a positive multiple thereof. (See proof in Appendix 3). The requirement☑<0 follows from our version of SCO. If we had followed risk equity and enforced a negative reaction to stronger positive correlations in individual outcomes, the condition would read 0 <☑< 1, provided we impose an additional axiom securing risk sensitivity (see footnote 12 and the proof in Appendix 3). (Calvo and Dercon 2013, 729) 			
Covariant shocks	No				
Idiosyncratic shocks	No				
Individual vulnerability	Yes	Let individual vulnerability (v) depend on the poverty line ($z \in R++$), a vector con-taining outcomes for k possible states of the world $\mathbb{P}y \in \mathbb{R}k$ s stand for an r-dimensional v = f(z,p, y). Next, define expected outcome $\mathbb{E}[y] \equiv \mathbb{P}k$ the corresponding probabilities $\mathbb{P}p \in \mathbb{P}k\mathbb{P}$, where $\mathbb{P}k \equiv \mathbb{P}p \in \mathbb{R}k$ Vulnerability is thus measured by a function $f : \mathbb{R}++ \times \mathbb{P}k \times \mathbb{R}k$ $+: \mathbb{P}k$ and a vector containing $s=1 \text{ ps} = 1\mathbb{P}$. outcome yc, which is determined by $f(z,p, y) \equiv f(z,p, yc1k)$. Also, define vector x and its elements $xs \equiv ys$ s=1 ps ys and the risk-free	No	poverty line; possible states of the world; probabilities of possible states of the world.	

Possible states	Yes	equivalent With this notation, (z,p, y) will summarise the information of an individual who z, which rescale outcomes in terms of the poverty line. realises and fears that, with some likelihood, the future may turn out to be a state of affairs, where outcome is painfully low. It will be convenient, though not necessary, to think of our outcomes ys as consumption levels. What we need to remark is that outcomes aremeasured after all smoothing efforts have been deployed (Calvo and Dercon 2013, 724)	Yes	It will be convenient, though not necessary,
of the world	Yes	bility of low outcomes or overall risk exposure (as defined in Rothschild and Stigliz 1970) increases. (Calvo and Dercon 2013, 725)	Yes	 It will be convenient, though not necessary, to think of our outcomes ys as consumption levels. (Calvo and Dercon 2013, 724) [] Consumption values were constructed using the total value of food and non-food consumption, based on purchased items, as well as from the own harvest and from gifts. They were deflated using a local food Laspeyres price deflator using 1994 as the base. (Calvo and Dercon 2013, 732) [] Further controls are introduced via village fixed effects (a set of dummies) and variables accounting for household composition changes over time. To account for the endogeneity of lagged consump- tion, we used lagged holdings of land and of livestock as identifying instruments.20,21 20 Land is not privately owned, but user

				rights are allocated by local authorities, while livestock is both a factor of production for these mixed farmers, and the main liquid asset for accumulation and smoothing. Together they are by far the most important assets in this rural economy. 21 More detailed diagnostics and discussion of the validity of the instruments is available upon request. Note nevertheless that the key purpose is to get a predictionmodel for different values of the shock variables. 22 The Hausman test provided no guidance in our case (as not infrequent in small samples), but the Bre- usch-Pagan test suggested the existence of random e (Calvo and Dercon 2013, 732)
Poverty line	Yes	Our aim is merely to make an ex- ante statement on the vulnerability of the individual to fall below a poverty norm z, (Calvo and Dercon 2013, 724)	Yes	More detailed diagnostics and discussion of the validity of the instruments is available upon request. Note nevertheless that the key purpose is to get a predictionmodel for different values of the shock variables(Calvo and Dercon 2013, 732)
Probabilities of possible states of the world	Yes	the proba- bility of low outcomes or overall risk exposure (as defined in Rothschild and Stigliz 1970) increases. (Calvo and Dercon 2013, 725)	Yes	More detailed diagnostics and discussion of the validity of the instruments is available upon request. Note nevertheless that the key purpose is to get a predictionmodel for different values of the shock variables. (Calvo and Dercon 2013, 732) [] We can now use this model in each period t – 1 to predict outcomes for possible states of the world. For rainfall, we will be able to use the village-specific distribution as implied by the rainfall patterns of the last 30years. For other sources of risk, we assume for simplicity that these risks are idiosyncratic, and that for each year, the village-specific realisations in the data give

					the probability distribution of this risk. We assume that this village-level distribution is independent of rainfall risk. Alterna- tive distributional assumptions were also explored, with only a limited impact on the findings. (Calvo and Dercon 2013, 733)
Shocks	No				
Vulnerability to poverty	Yes	Remarking that we are interested in vulnerability to poverty will also be useful to preempt any confusion with vulnerability to downfalls in wellbeing. Our reference point is an absolute poverty norm (e.g. as in Chaudhuri 2003; Suryahadi and Sumarto 2003, or Christiaensen and Subbarao 2005), and not the initial individual position. (Calvo and Dercon 2013, 723)	No	Individual vulnerability; aggregate vulnerability ²⁸	
vulnerability	Yes	In this article, we explore the notion of vulnerability to poverty, closely linked with the magnitude of the threat of poverty, measured ex- ante, before uncertainty has been resolved. [] To clarify how all these intuitions come together under the concept of vulnerability, this paper proposes an axiomatic approach to themeasurement of both individual and aggregate vulnerability. (Calvo and Dercon 2013, 722)	Νο	Individual vulnerability; aggregate vulnerability	

²⁸ The deconstruction of vulnerability to poverty as composed of these two constructs is strongly implied, although never made entirely explicit.

Construct	Defined?	Definition or further info	Directly	Indirectly	Operational text
Construct	<u>Defined.</u>		Operationalized?	operationalized	
				through:	
Access to food	Yes	conceptual framework drawn from it by	Not	[name of	
		Løvendal and Knowles (2005).	operationalized	construct]	
		(Capaldo et al. 2010, 7)		,	
Chronically food	ves	undernourished (food insecure) while	No	Present food	
insecure	,	also being vulnerable; these are		security status;	
		considered chronically food		Expected future	
		(Capaldo et al. 2010, 16)		food security	
				status	
Current	YES	conceptual framework drawn from it by	Yes		We use ex-post data on shocks and
exposure to risk		Løvendal and Knowles (2005).			risk management strategies. These
		(Capaldo et al. 2010, 7)			include information on the incidence
					of a covariate shock (such as
					drought) and an idiosyncratic shock
					(illness), as well as the number of
					government and non-governmental
					programs from which households
					received assistance. In this
					application, we are not able to
					complement this with information
					on future risks and risk management
					strategies. We note that nearly a
					quarter of households report being
					affected by drought
					(Capaldo et al. 2010, 12)
Current socio-	YES	conceptual framework drawn from it by	Yes		We estimate daily per capita
economic		Løvendal and Knowles (2005).			kilocalorie consumption as a
characteristics		(Capaldo et al. 2010, 7)			function of several variables
					representing the households'
					demographic and social
					characteristics, asset holdings,
					liquidity constraints, access to
					infrastructure, occurrence of shocks

					and geographic location. Special attention is given to households that are linked to - or earn a significant proportion of their livelihoods from the agricultural sector. Table 1 provides a list of all variables, including their mean value and standard deviation. We have omitted from Table 1 the dummy variables for household location. Table 1: Summary of variables (Capaldo et al. 2010, 11)
Events	Yes	conceptual framework drawn from it by Løvendal and Knowles (2005). (Capaldo et al. 2010, 7)	No	Risks; risk management	
Expected future food security status	Yes	conceptual framework drawn from it by Løvendal and Knowles (2005). (Capaldo et al. 2010, 7)	No	Present food security status; events	
Food availability	Yes	conceptual framework drawn from it by Løvendal and Knowles (2005). (Capaldo et al. 2010, 7)	Not operationalized		
Food consumption	Yes	conceptual framework drawn from it by Løvendal and Knowles (2005). (Capaldo et al. 2010, 7)	Not operationalized		
Food security	Yes	As table 4 shows, only 44.3% of households enjoy stable levels of food security in our sample; that is they are food secure and not vulnerable. On the other hand, 20.3% of the population is undernourished (food insecure) while also being vulnerable; these are considered chronically food insecure. 29.2% of households are currently undernourished but only temporarily (transient food insecure). Most	No	Present food security status; Expected future food security status	

		importantly, about 6% of households in our sample are food secure at present, while being at risk of being undernourished (food insecure) in the future. Therefore, in the case of Nicaragua a targeting error could potentially affect more than one third of the population (29.2%+6.2%=35.4%). Overall, in Nicaragua 26.5% of households are vulnerable to food insecurity, exhibiting an average vulnerability of 77%. (Capaldo et al. 2010, 16)			
Food utilization	Yes	conceptual framework drawn from it by Løvendal and Knowles (2005). (Capaldo et al. 2010, 7)	Not operationalized		
Future food security	Yes	conceptual framework drawn from it by Løvendal and Knowles (2005). (Capaldo et al. 2010, 7)	Not operationalized		
Future nutritional status	Yes	conceptual framework drawn from it by Løvendal and Knowles (2005). (Capaldo et al. 2010, 7)	Not operationalized		
Permanently food secure	Yes	BY DEFAULT	No	Present food security status; Expected future food security status	
Present characteristics	Yes	conceptual framework drawn from it by Løvendal and Knowles (2005). (Capaldo et al. 2010, 7)	No	Current socio- economic characteristics; current exposure to risks	
Present food security status	Yes	conceptual framework drawn from it by Løvendal and Knowles (2005). (Capaldo et al. 2010, 7)	No	Present characteristics	

Risk management	Yes	conceptual framework drawn from it by Løvendal and Knowles (2005). (Capaldo et al. 2010, 7)	Yes		We use ex-post data on shocks and risk management strategies. These include information on the incidence of a covariate shock (such as drought) and an idiosyncratic shock (illness), as well as the number of government and non-governmental programs from which households received assistance. In this application, we are not able to complement this with information on future risks and risk management strategies. We note that nearly a quarter of households report being affected by drought (Capaldo et al. 2010, 12)
Risks	Yes	conceptual framework drawn from it by Løvendal and Knowles (2005). (Capaldo et al. 2010, 7)	Yes		We use ex-post data on shocks and risk management strategies. These include information on the incidence of a covariate shock (such as drought) and an idiosyncratic shock (illness), as well as the number of government and non-governmental programs from which households received assistance. In this application, we are not able to complement this with information on future risks and risk management strategies. We note that nearly a quarter of households report being affected by drought (Capaldo et al. 2010, 12)
Transitory food insecure	Yes	undernourished but only temporarily (transient (Capaldo et al. 2010, 16)	No	Present food security status; Expected future food security status	

Transitory food secure		food secure at present, while being at risk of being undernourished (food insecure) (Capaldo et al. 2010, 16)	No	Present food security status; Expected future food security status	
Vulnerability	Yes	conceptual framework drawn from it by Løvendal and Knowles (2005). (Capaldo et al. 2010, 7)	Not operationalized		
Vulnerability to future food insecurity	Yes	conceptual framework drawn from it by Løvendal and Knowles (2005). (Capaldo et al. 2010, 7)		Expected future food security status	

Article: (CARE 20	09)		-	1	
<u>Construct</u>	Defined?	Definition or further info	Directly Operationalized?	Indirectly operationalized through:	Operational text
Adaptation to climate change	Yes/no	Adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities.10 (CARE 2009, 7)	Not operationalized		
adaptive capacity	Yes	The ability of a system to adjust to climate change (including climate variability and extremes) to moderate potential damages, to take advantage of opportunities, or to cope with the consequences.6 (CARE 2009, 5)	Yes		Capacity Development - What institutions (governmental and non- governmental) are involved in research, planning and implementation of adaptation? What are the most important institutions in facilitating or constraining adaptation? - Do local institutions (governmental and non- governmental) have capacity to monitor and

Climate change	Yes	Any change in climate over time,	Not	 analyze information on current and future climate risks? Are mechanisms in place to disseminate this information? Do local institutions have capacity to plan and implement adaptation activities? - Are resources allocated for implementation of adaptation-related policies? What is the budget? Where are the resources coming from? What are the existing capacity and resource needs and/or gaps for climate change adaptation? - What new capacities may be needed to address changing circumstances due to climate change? [] Addressing Underlying Causes of Vulnerability What social groups within the community are most vulnerable to climate change? - Are local planning processes participatory? Do women and other marginalized groups have a voice in local planning processes? - Do local policies provide access to and control over critical livelihoods resources for all? - What are the other factors constraining adaptive capacity of the most vulnerable groups? Do vulnerable communities and groups have any influence over these factors? (CARE 2009, 16)
	Yes	Any change in climate over time, whether due to natural variability or as a result of human activity.4 (CARE 2009, 5)	Not operationalized	
community level	No			
financial capital	No			

human capital No Imatural capital No natural capital No Imatural capital No Imatural capital No Resilience Yes The ability of a community to resist, absorb, and recover from the effects of hazards in a timely and efficient manner, preserving or restoring its essential basic structures, functions and identity.8 Yes Resilient Livelihoods - Are scaled-down climate change for the region and/or ecological zone? Do local institutions have access to information on current and future climate change? - Up local institutions are economic sectors are most vulnerable to climate change? - Do local government and NGO extension workers understand climate risks and promote adaptation strategies? social cpaital No	Hazard	Yes	A dangerous phenomenon, substance, human activity or condition that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage.9 (CARE 2009, 6)	yes	Disaster Risk Reduction - What are the most important climate- related hazards the region and/or ecological zone faces? Non-climate related? How are hazards likely to change over time as a result of climate change? - What groups within the community are most vulnerable to disasters? - Do local institutions have access to disaster risk information? - Are local disaster risk management plans being implemented? - Are functional early warning systems in place at the local level? - Does the local government have the capacity to respond to disasters? - Which other institutions are engaged disaster risk management at local level? - (CARE 2009, 16)
natural capital No natural capital No physical capital No Resilience Yes The ability of a community to resist, absorb, and recover from the effects of hazards in a timely and efficient manner, preserving or restoring its essential basic structures, functions and identity.8 (CARE 2009, 6) Yes Resilient Livelihoods - Are scaled-down climate projections available? - If so, what are the observed and predicted impacts of climate change for the region and/or ecological zone? Do local institutions have access to information on current and future climate risks? - What livelihood groups or economic sectors are most vulnerable to climate change? - Do local plans or policies support climate-resilient livelihoods? - Ob local government and NGO extension workers understand climate risks and promote adaptation strategies? (CARE 2009, 16)	human capital	No			
ResilienceYesThe ability of a community to resist, absorb, and recover from the effects of hazards in a timely and efficient manner, preserving or restoring its essential basic structures, functions and identity.8 (CARE 2009, 6)YesResilient Livelihoods - Are scaled-down climate projections available? - If so, what are the observed and predicted impacts of climate change for the region and/or ecological zone? Do local institutions have access to information on current and future climate risks? - What livelihood groups or economic sectors are most vulnerable to climate change? - Do local plans or policies support climate resilient livelihoods? - - Do local government and NGO extension workers understand climate risks and promote adaptation strategies? (CARE 2009, 16)		No			
absorb, and recover from the effects of hazards in a timely and efficient manner, preserving or restoring its essential basic structures, functions and identity.8 (CARE 2009, 6) (CARE 2009, 6)	physical capital	No			
	Resilience		absorb, and recover from the effects of hazards in a timely and efficient manner, preserving or restoring its essential basic structures, functions and identity.8	Yes	climate projections available? - If so, what are the observed and predicted impacts of climate change for the region and/or ecological zone? Do local institutions have access to information on current and future climate risks? - What livelihood groups or economic sectors are most vulnerable to climate change? - Do local plans or policies support climate-resilient livelihoods? - - Do local government and NGO extension workers understand climate risks and promote adaptation strategies?

vulnerability to climate change	Yes	The degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change,	No	Adaptive capacity	
		including climate variability and extremes. Vulnerability is a function of			
		the character, magnitude, and rate of climate variation to which a system is			
		exposed, its sensitivity, and its adaptive capacity.5 (CARE 2009, 5)			

Article: (Chhihn a	nd Poch 201	2)			
<u>Construct</u>	Defined?	Definition or further info	Directly Operationalized?	Indirectly operationalized through:	Operational text
Climate change	No		Yes/no/ not operationalized	[name of construct]	
Current poverty status	Yes	This study adopts the approach to measuring household economic vulnerability posited and elaborated in Chaudhuri's (2003) study of household vulnerability (Chhihn and Poch 2012, 30)	Yes		Unlike Chaudhuri (2003), who analysed households' monthly per capita consumption expenditure, this study analyses households' monthly income to measure the household vulnerability index due to the lack of expenditure data. (Chhihn and Poch 2012, 30)
Environmental shocks	Yes	This study adopts the approach to measuring household economic vulnerability posited and elaborated in Chaudhuri's (2003) study of household vulnerability (Chhihn and Poch 2012, 30)	Yes		The predictors of log per capita income used in the analysis include: droughts in the past 12 years (dummy); windstorms in the past 12 years (dummy); floods in the past 12 years (dummy); household size; level of education; possession of motored vehicle (dummy); access to credit (dummy); presence of disabled persons in the households (dummy); and the dependency of liveli- hood on agriculture (dummy). (Chhihn and Poch 2012, 30)

Farmers	no				
Household characteristics	Yes	This study adopts the approach to measuring household economic vulnerability posited and elaborated in Chaudhuri's (2003) study of household vulnerability (Chhihn and Poch 2012, 30)	Yes		The predictors of log per capita income used in the analysis include: droughts in the past 12 years (dummy); windstorms in the past 12 years (dummy); floods in the past 12 years (dummy); household size; level of education; possession of motored vehicle (dummy); access to credit (dummy); presence of disabled persons in the households (dummy); and the dependency of liveli- hood on agriculture (dummy). (Chhihn and Poch 2012, 30)
Household vulnerability as expected poverty	Yes	Household vulnerability as ex- pected poverty is defined as the probability that households will move into poverty given certain environmental shocks, current poverty status and household characteristics of respondents. (Chhihn and Poch 2012, 30)	No	Environmental shocks; current poverty status; household characteristics; poverty	
Households	no				
Natural hazards	no				
Poverty	Yes	Technically, the household vulnerability index is derived from the difference between the ex- pected log per capita income and the minimum log per capita income threshold, with households having per capita incomes lower than the minimum per capita income defined as vulnerable (poor). The expected log per capita income is estimated using the three-step feasible generalised least squares (FGLS) method. (Chhihn and Poch 2012, 30)	Yes		Technically, the household vulnerability index is derived from the difference between the ex- pected log per capita income and the minimum log per capita income threshold, with households having per capita incomes lower than the minimum per capita income defined as vulnerable (poor). The expected log per capita income is estimated using the three-step feasible generalised least squares (FGLS) method. (Chhihn and Poch 2012, 30)

<u>Construct</u>	Defined?	Definition or further info	Directly	Indirectly	Operational text
			Operationalized?	operationalized	
				through:	
Asset	Yes	Using Moser's (1998)	no	Labour; human	
vulnerability		asset vulnerability		capital; non-	
		framework as guidance,		labour	
		we selected a range of		productive	
		variables to create an		assets; social	
		index of household		capital	
		vulnerability from GLSS			
		4. Each variable captures			
		an aspect of			
		vulnerability.			
		(Dasgupta and Baschieri			
		2010, 807)			
Climate shocks	Yes	climate change shock,	No	drought	
		namely, drought.			
		(Dasgupta and Baschieri			
Communities	No	2010, 810)			
Communities at	No				
risk of climate	NO				
shocks					
Drought	Yes	We consider the first	Yes		We consider the first approach and use deficiency in rainfall
2100.8.11		approach and use			as the definition of
		deficiency in rainfall as			drought in this study.
		the definition of			(Dasgupta and Baschieri 2010, 810)
		drought in this study.			
		[]			
		for some, drought is			
		defined as a deficiency			
		in rainfall, or rainfall			
		which is lower than the			
		expected amount in a			
		certain period (van der			

		Ge (Dasgupta and Baschieri 2010, 810)			
Household relations	Yes	Moser (1998) identified household relations as the fourth asset, as these influence the ability of households to adjust to shocks and changes. Their households are the first safety t for vulnerable individuals. The structure, composition and cohesion of each household's members determine those households' ability to mobilise labour and to share both expenditure- reducing and income- generating strategies. However, the ques (Dasgupta and Baschieri 2010, 808)	Not operationalized		
Household vulnerability to climate change	Yes	Using the GLSS 4, we applied the asset vulnerability framework developed by Moser (1996, 1998, 2007). We constructed an index of vulnerability to climate change, at the household level. (Dasgupta and Baschieri 2010, 807)	No	Asset vulnerability	
Human capital	Yes	The second asset Moser (1998) identified is	Yes		We used the level of education of the heads of households and access to health care as proxies for human capital. It can

		human capital. Social services that offer education, health care and economic infrastructure for water, transport and electricity help to determine the ability of households to work and to profit from that work. (Dasgupta and Baschieri 2010, 808)		be argued that more educated households are likely to survive climate shocks better, as they are more likely to find alternative avenues of employment. Similarly, households which have higher levels of female education are more likely to be able to mobilise more members into the workforce in the event of a shock. Education level was treated as binary where the household head either had achieved primary school education or less, or secondary education or higher. A growing amount of literature also suggests human health is likely to be affected by global climate change (Haines and Parry, 1993; Kovats et al., 2003; Epstein, 2005; Haines et al., 2006). Evidence exists that an increase in infectious diseases including malaria and diarrhoeal diseases is likely in the face of climate change.We therefore included a variable to capture a household's ability to deal with increased morbidity in the vulnerability index, assuming that households without access to decent health facilities would be more likely to be affected by climate change shocks. Data of the existence of health facilities in the community were assigned to each household.We considered the existence of a hospital to be ideal, followed by that of a clinic. The third and lowest category was a household with access to neither a hospital nor clinic.
Labour	Yes	The first asset Moser	Yes	(Dasgupta and Baschieri 2010, 808) The primary type of work in which the head of the
		identified is labour (Dasgupta and Baschieri 2010, 807)		household was engaged was included into the vulnerability index. This variable was binary, the categories being either in agricultural work or not. The percentage of total income derived from agriculture was also included, with a high percentage being taken to indicate more vulnerable households. We created this variable by dividing household income from agriculture by the total household income. It is possible that a household that has a high percentage of income from agriculture could be because they are an agriculturally successful household. Nevertheless, we still consider them to be a vulnerable household, as they are more dependent on climate and

				changes in climate—such as drought—have potentially negative implications for their livelihood. We also considered the percentage of income derived from remittances.We assume that households receiving incomefrom peoplewhowork elsewhere are less vulnerable, because household production and remittance income are less likely to be correlated, and the household is therefore less reliant on one source of income (Moser and Felton, 2007). However, it is important to note that heavy dependence on remittances can in some cases be a sign of vulnerability, as an economic shock elsewhere may stop the flow of remittances. For the purpose of this study, we assume that remittances are a sign of security, as in the event of a climate change shock in the local area, the household is more likely to have an ongoing income in the form of remittances. A variable detailing the proportion of the household that is under 15 or over the age of 65 was included, to reflect how many dependents there are in a household who are less likely to be contributing economically. Finally, we considered the percentage of total household expenditure spent on food. Households that spend a large percentage of their money on food may be considered more vulnerable, as food is a necessity (Sagoe, 2006). (Dasgupta and Baschieri 2010, 808)
Non-labour productive assets	Yes	Non-labour productive assets are the third type. Moser (1998) identified land, sewing machines, radios, refrigerators and motor vehicles as important productive assets for rural households, which can either be used or sold in order to buffer short-term climatic shocks.	Yes	In order to measure the different degrees of productive assets between households we used the total number of productive assets owned by the household as a proxy. Among reproducible capital assets the questionnaire included furniture, sewing machines, stoves, refrigerator- freezers, air conditioners, fans, radios, radio-cassette players, record players, three-in-one radio-cassette players, video equipment, washing machines, TVs, cameras, electric irons, bicycles, motorcycles, cars, houses, land, shares, boats, canoes and outboard motors. Each asset was weighted equally. (Dasgupta and Baschieri 2010, 808)

		(Dasgupta and Baschieri 2010, 808)		
Prepared for adverse consequences	No			
Risk of experiencing climate change shock	Yes	We use average annual rainfall data, which serves as a proxy for risk of climate-change- related shock. (Dasgupta and Baschieri 2010, 810)	Yes	We use average annual rainfall data, which serves as a proxy for risk of climate-change-related shock. (Dasgupta and Baschieri 2010, 810)
Social capital	Yes	Social capital isMoser'sfifth asset as it reduces vulnerability and increases opportunities. Moser and Felton (2007: p. 13) defined social capital as 'the rules, norms, obligations, reciprocity and trust embedded in social relations, social structures and societies' institutional arrangements.' Social capital is generally provided through membership of social networks which can be bonded in a formal or informal nature. Social capital can also be enhanced through social learning and adaptive governance (Olsson et al., 2004; Folke et al.,	Yes	However, social capital is often considered difficult to operationalize in a household survey as it can operate at different levels and scales. We used a variable from the community questionnaire to serve as a proxy. This variable iswhether a system of mutual aid forfieldworkexistedamongthe farmers of thehousehold'scommunity. We considered those with a system of mutual aid to be less vulnerable. It could be argued that social capital is not useful in the face of a climate change shock, as that would affect all the households in a community. If one agricultural household is hit, their neighbours are likely to be hit, too. However, we argue that although these households would be hit equally, a household in the community that is involved in another profession or is more educated might be able to offer assistance to more vulnerable households. Moreover, Brons et al. (2004) found in their study of livelihood strategies in Burkina Faso and Mali that food security depends on institutional and social-exchange networks. We therefore included this proxy for social capital. Althoughsystemsof mutual aidamongfarmers reflect only social networks between those involvedin agriculture, they are still useful as aproxyfornetworks withincommunities between households of different professions and characteristics. We consider social capital in its widest sense as social-resource networks, social groups,

		2005; Pelling and High, 2005; Pelling, 2007). Adaptive governance as a dynamic management approach of social- ecological systems has proven itself particularly useful in periods of crisis as it utilises social sources and social learning, drawing on experiences and common understanding and policies of different groups. In the specific context of climate change a number of studies have identified social capital as important in enhancing the community adaptive capacity to climate change (Adger, 2003; van der Geest, 2004; Bryan et al., 2009) [] We consider social capital in its widest sense as social-resource		trust and reciprocity. For this reason, we also include whether there is a road near the community to which its members have access, as it can be argued that roads are one type of proxy for the extent to which communities are able to interact with the outside world and potentially receive assistance (Sachs, 2005). This information was available in the community-level data. We divided this variable into three main categories: (a) Yes, always usable, (b) Yes, sometimes unusable, (c) No road. (Dasgupta and Baschieri 2010, 809)
		[] We consider social capital in its widest		
		sense as social-resource networks, social groups, trust and reciprocity (Dasgupta and Baschieri 2010, 809)		
Welfare of rural households	No	2010, 0007		

Article: (Deressa, Hassan, and Ringler 2009)

<u>Construct</u>	Defined?	Definition or further info	Directly Operationalized?	Indirectly operationalized through:	Operational text
Climate and non-climate shocks	no		Yes/no/ not operationalized	[name of construct]	
Ethiopean Farmers	no				
Expected Poverty	Yes	This method is based on estimating the probability that a given shock or set of shocks will move household consumption below a given minimum level (such as a consumption poverty line) or force the consumption level to stay below the minimum if it is already below this level (Chaudhuri et al. 2002). (Deressa, Hassan, and Ringler 2009, 3)	No	Minimum consumption (income) level	
Household consumption (income)	no				
Minimum consumption (income) level	Yes	a given minimum level (such as a consumption poverty line) (Deressa, Hassan, and Ringler 2009, 3)	Yes		The choice of minimum levels of income is based on different assumptions such as the international poverty line of 1.25 US per day (World Bank, 2008), average income of the surveyed households and arbitrary values above and below the average income of the surveyed households. (Deressa, Hassan, and Ringler 2009, 11)
Vulnerability	Yes	Thus, vulnerability is seen as expected poverty, while consumption (income) is used as a proxy for well-being.	No	Expected Poverty	

	(Deressa, Hassan, and Ringler		
	2009, 3)		

<u>Construct</u>	Defined?	Definition or further info	Directly	Indirectly	Operational text
			Operationalized	operationalized	
			?	through:	
Cross- scalar	Yes	"teleconnections", a term used in	No	Nested system	
teleconnection		climatology in relation to "any transmission			
		of a coherent effect beyond the location			
		where the forcing occurred" (Chase et al.,			
		2005). For example, one of the			
		teleconnections associated with the El Nin			
		~ o-Southern Oscillation effect is severe			
		drought			
		in Northeastern Brazil. Teleconnections are			
		also associated with other climate			
		phenomena such as the North Atlantic			
		Oscillation. The label of "teleconnection" is			
		not explanatory in and of itself, but rather			
		signifies the existence of a correlation in			
		events, and highlights the need to explore			
		the connecting mechanisms and drivers in			
		order to anticipate outcomes.			
		(Eakin, Winkels, and Sendzimir 2009, 400)			
Exogenous	Yes	exogenous drivers (i.e. the risk and stress	Yes		The volatility of prices has
drivers		factors)			historically been a source of
		(Eakin, Winkels, and Sendzimir 2009, 399)			significant economic uncertainty
					for producers.
					(Eakin, Winkels, and Sendzimir
					2009, 401)
Geographically	Yes	vulnerabilities and responses of farm	Yes		The Mexican case study took place
distant		households in distinct geographic locations			in 2003, as farmers were
household		(Eakin, Winkels, and Sendzimir 2009, 400)			emerging from the most recent
vulnerability					coffee crisis. The research took
					place in two coffee-producing
					communities in the region of

				Coatepec, in Central Veracruz. In addition to interviews with public officials, coffee association leaders, academics and coffee processors and traders, a household survey collected data on the perceptions and responses of 60 households to the coffee situation (Eakin et al., 2006). The project was part of a broader study exploring the implications of climatic variability and change for coffee farming in Mexico (Gay Garcia et al., 2006). In Vietnam, a study of migrant livelihoods included many coffee farmers, mostly migrants to the Central Highland region (Winkels, 2004). Livelihood surveys and interviews with 81 households originating from the overpopulated Red River Delta in the north provides important insights into both the opportunities andrisk of coffee farming at Vietnam's southern mountain frontier when the first signs of the looming coffee crisis became evident in 2000 and 2001. (Eakin, Winkels, and Sendzimir 2009, 402)
Geographically specific signals of change	Yes	geographically specific signals of change – such as a shift in market opportunities, a drought, a change in public policy or new form of land use in a specific location – (Eakin, Winkels, and Sendzimir 2009, 400)	Yes	The Mexican case study took place in 2003, as farmers were emerging from the most recent coffee crisis. The research took place in two coffee-producing communities in the region of Coatepec, in Central Veracruz. In

Household	Yes	factors interpal to the household (i.e. shility	Yes	addition to interviews with public officials, coffee association leaders, academics and coffee processors and traders, a household survey collected data on the perceptions and responses of 60 households to the coffee situation (Eakin et al., 2006). The project was part of a broader study exploring the implications of climatic variability and change for coffee farming in Mexico (Gay Garcia et al., 2006). In Vietnam, a study of migrant livelihoods included many coffee farmers, mostly migrants to the Central Highland region (Winkels, 2004). Livelihood surveys and interviews with 81 households originating from the overpopulated Red River Delta in the north provides important insights into both the opportunities andrisk of coffee farming at Vietnam's southern mountain frontier when the first signs of the looming coffee crisis became evident in 2000 and 2001. (Eakin, Winkels, and Sendzimir 2009, 402)
Household responses	Yes	factors internal to the household (i.e. ability to mitigate and cope with stress) (Eakin, Winkels, and Sendzimir 2009, 399)	res	The Mexican case study took place in 2003, as farmers were emerging from the most recent coffee crisis. The research took place in two coffee-producing communities in the region of Coatepec, in Central Veracruz. In addition to interviews with public

Livelihood		Du placing the boursheld as the focus of			officials, coffee association leaders, academics and coffee processors and traders, a household survey collected data on the perceptions and responses of 60 households to the coffee situation (Eakin et al., 2006). The project was part of a broader study exploring the implications of climatic variability and change for coffee farming in Mexico (Gay Garcia et al., 2006). In Vietnam, a study of migrant livelihoods included many coffee farmers, mostly migrants to the Central Highland region (Winkels, 2004). Livelihood surveys and interviews with 81 households originating from the overpopulated Red River Delta in the north provides important insights into both the opportunities andrisk of coffee farming at Vietnam's southern mountain frontier when the first signs of the looming coffee crisis became evident in 2000 and 2001. (Eakin, Winkels, and Sendzimir 2009, 402)
Livelihood vulnerability	Yes	By placing the household as the focus of analysis, livelihood approaches highlight both the exogenous drivers (i.e. the risk and stress factors) and the factors internal to the household (i.e. ability to mitigate and cope with stress) which together influence household security and well-being (Chambers and Conway, 1992; Ellis, 1998). (Eakin, Winkels, and Sendzimir 2009, 399)	No	Exogenous drivers; geographically specific signals of change; geographically distant household vulnerability;	

				household responses; response outcomes	
Nested and teleconnected livelihood vulnerability	Yes	In this article we use the concept of "nested and tele- connected vulnerabilities" to illustrate how the vulnerabilities and responses of farm households in distinct geographic locations are linked through cross-scalar processes, as well as "teleconnected" in space and time. In a nested system, profoundchanges inkeyvariablesthatoperatenormallyonly at one level, e.g., within a defined geographic region or admin- istrative domain, can have non-linear outcomes for processes operating at broader scales of analysis (Gunderson andHolling, 2001). (Eakin, Winkels, and Sendzimir 2009, 400)	No	Livelihood vulnerability; Nested Systems	
Nested system	Yes	In a nested system, profoundchanges inkeyvariablesthatoperatenormallyonly at one level, e.g., within a defined geographic region or admin- istrative domain, can have non-linear outcomes for processes operating at broader scales of analysis (Gunderson andHolling, 2001). Local level processes can episodically influence larger scale phenomena, and such explosive "upward cascades" can be sources of surprise at distant locations. (Eakin, Winkels, and Sendzimir 2009, 400)	Yes		In the following sections, we use the case of the responses of farmers in Vietnam and Mexico to the evolution of the global coffeemarket over the past three decades [] (Eakin, Winkels, and Sendzimir 2009, 399) The last two decades have witnessed a significant shift in the structure of the international coffee market, moving from a system of government-mediated market quotas to a neoliberalmodel, characterized by the elimination of barriers to trade. This precipitated an abrupt restructuring of the relationships

		between producing nations,
		traders and con- sumers, as well as
		between farmers and domestic
		institutions, all with direct
		implications for the livelihood
		security of coffee producers
		globally (Lewin et al., 2004). In
		1989 the Interna- tional Coffee
		Agreement, which had operated a
		quota system to regulate coffee
		exports from the world's largest
		coffee producers, collapsed. In the
		absence of export restrictions,
		large amounts of coffee entered
		the market, inventories of green
		coffee in importing nations
		increased and, in the face of
		relatively stagnant demand, world
		coffee prices began a phase of
		steep decline (Ponte, 2002).
		Concurrent with the closure of the
		ICA, the market power of a
		handful of coffee traders and
		distributors increased (e.g.,
		Proctor&Gamble, Nestle ⁷ , and
		Sara Lee), concentrating profit in
		the coffee roasting and distribu-
		tion stage of the commodity chain
		(Lewin et al., 2004). The end of the
		1980s and early 1990s alsomarked
		a period
		of transition in the domestic
		policies in many coffee- producing
		countries, inspired by a global shift
		in economic and political ideology.
		The end of the ColdWar and the
		rise of neoliberalism generated a
		shift in both the political motiva-

				tions behind economic policy intervention and the participa- tion of coffee-producing countries in global markets. (Eakin, Winkels, and Sendzimir 2009, 401)
Response outcome	Yes	outcomes of these responses in terms of individual or household welfare. (Eakin, Winkels, and Sendzimir 2009, 399)	Yes	The Mexican case study took place in 2003, as farmers were emerging from the most recent coffee crisis. The research took place in two coffee-producing communities in the region of Coatepec, in Central Veracruz. In addition to interviews with public officials, coffee association leaders, academics and coffee processors and traders, a household survey collected data on the perceptions and responses of 60 households to the coffee situation (Eakin et al., 2006). The project was part of a broader study exploring the implications of climatic variability and change for coffee farming in Mexico (Gay Garcia et al., 2006). In Vietnam, a study of migrant livelihoods included many coffee farmers, mostly migrants to the Central Highland region (Winkels, 2004). Livelihood surveys and interviews with 81 households originating from the overpopulated Red River Delta in the north provides important insights into both the opportunities andrisk of coffee farming at Vietnam's southern

		mountain frontier when the first signs of the looming coffee crisis became evident in 2000 and 2001.
		(Eakin, Winkels, and Sendzimir
		2009, 402)

Article: (Eakin et	al. 2012)				
Construct	Defined ?	Definition or further info	Directly Operationalized?	Indirectly operationalized through:	Operational text
Adaptiveness	Yes	Conceptually, the process of household adaptation could be considered a function of the current state of the household (entitlements, assets, activities) and the biophysical, politi- cal, economic, institutional contexts in which decisions are made (determining the choice set for any household); the exposure and sensitivity of a household to stress and change; the decisions taken; and the outcome of those decisions. Adaptation is a decision process designed to "maintain capacities to deal with future change" and thus can involve actions that enhance adaptive capacities (Nelson et al. 2007). A household's experience of an environmental shock or change— how it copes with the event—may result in a rel- atively dramatic change in livelihood activities with poten- tially negative welfare outcomes (e.g., increased poverty) or, alternatively, may provide opportunities for learning and welfare improvements and thus enhanced adaptive capaci- ties (McSweeney and Coomes 2011)	No	Impacts & responses to Hurricane Stan by coffee farmers	

		(Eakin et al. 2012, 477)			
Disaster	No				
Impacts & responses to Hurricane Stan by coffee farmers	Yes	In this paper, we document household responses to a climatic shock, Stan, to gain insight into how natural resource- dependent communities move to secure their livelihoods following significant loss, the implications of household responses for coffee farming as a "domain of attraction," as well as to highlight those aspects of household choices and perceptions that may be indicative of resilience at broader scales. (Eakin et al. 2012, 477)	yes		This study is based on 64 household surveys and additional in-depth expert and key-informant interviews, conducted in 2006 and 2007. The surveys, implemented 18 months following Stan, collected information regarding pre- and post- Hurricane Stan activities and income sources, house- hold demographics, land holdings, production attributes, hurricane impacts (to property, production and health and welfare), household assets before and after Stan and access to agricultural and emergency response services. As described later, the survey also captured households' per- ceptions and attitudes about the disaster and their suscep- tibility to damage. Three of the most affected communities by Hurricane Stan in the municipio of Siltepec, Vega de Guerrero (pop. 410), Vicente Guerrero (pop. 151) and San Bartolo (pop. 185) were purposely selected for study on the basis of prior experience of one of the investigators in the region.1 (Eakin et al. 2012, 478)
Resilience	yes	A resilient system is one that maintains continued integrity of fundamental social–ecological services and functions under conditions of variability, surprise and stress (Carpenter et al. 2001; Folke et al. 2002). Learning, self- organization and adaptiveness have been proposed as core components of resilient communities. In this interpretation, adaptiveness refers to the ability of communities to "col- lectively manage	No	Adaptiveness	

		the resilience of the system" (Walker et al. 2004) or, in other words, to actively manage how a system responds to change. Resilience is often evaluated with explicit reference to a desired state or (in less nor- mative terms) a "domain of attraction" (Gallopin 2006). A given system can have multiple domains of attraction, shifting states once thresholds are crossed. Resilience research seeks to understand the conditions in which thresholds are surpassed and shifts in state occur and strives to relate those conditions to specific human inter- ventions that facilitate or inhibit such shifts in state (Walker and Meyers 2004). (Eakin et al. 2012, 477)			
Resilience of rural livelihoods	Yes	In the next section, we briefly review the related con- cepts of resilience and vulnerability, focusing on an attri- bute central to the definition of both concepts: "adaptiveness" and "adaptive capacity." (Eakin et al. 2012, 476)	No	Resilience; vulnerability	
Vulnerability	Yes	The concept of vulnerability is closely linked to that of resilience; however, the concepts emerged from different disciplinary traditions and have distinct applications, with implications for the utility of these concepts for different units of analysis (Eakin and Luers 2006; Turner 2010). Vulnerability generally refers to the propensity of some unit of exposure to experience harm. In practice, house- holds are often a convenient unit of analysis for vulnera- bility assessments	No	Adaptiveness	

that aim to differentiate a population in	
terms of sensitivity to a particular	
stressor and capacities to effectively	
respond (Eakin and Luers 2006). At the	
nousehold level, vulnerability is often	
evaluated by assessing exposure (the	
physical relation of the household to a	
stressor) and sensitivities to the losses	
experienced (e.g., what the impact	
means for the household's function and	
survival), as well as by the households'	
ability to cope and adapt, or its	
"adaptive capacity," prior to and after	
experiencing loss.	
Eakin et al. 2012, 477)	

Article: (Échev	Article: (Échevin 2011)						
<u>Construct</u>	Defined?	Definition or further info	Directly Operationalized?	Indirectly operationalized through:	Operational text		
Community level	Yes	an extension of this empirical framework will consist in using two-level (i.e. household and community levels) modelling of the impact of those shocks following Günther and Harttgen (2009)'s approach. (Échevin 2011, 3)	Yes		Table 2 presents summary statistics for variables used in the analysis. Consumption and as income are expressed in Gourdes. The agricultural index is a composite indicator which is a linear combination of categorical variables obtained from a multiple correspondence analysis (cf. Asselin, 2009). Variables considered in the analysis are the number of lands, animals and agricultural materials owned by the household. The community index is a linear combination of community basic infrastructure and access to market variables (roads, access to elementary or secondary schools, health centres, markets, electricity and cell phone). A score of income diversity has also been built from the various income sources earned by the household. As four main income sources are declared by the household, the income diversity variable (ID) is defined 4		

	1	1			1
					IDi =
					21
					? −1 ∑ (s) ?, where k k 2
					2 2
					k =1 i
					? ?
					is is the share of the kth income source in total income of
					household i. This score equals 0 when only one source of
					income is declared by the household. It averages 0.17 in
					the studied population.
Coveriate	No				(Échevin 2011, 10)
Covariate shocks	No				
Determinants	No				
of poverty					
and					
vulnerability					
Economic	Yes	In order to fully characterize	No	Household level;	
well-being		the determinants of poverty		community level	
		and vulnerability in rural Haiti,			
		а			
		unique survey can be used to			
		assess the impact of			
		idiosyncratic and covariate			
		shocks on econ			
		(Échevin 2011, 3)			
Household	Yes	we can define vulnerability to	No	Economic well-	
vulnerability		poverty as the probability of	-	being	
to poverty		falling into			
		poverty when one's			
		consumption/income falls			
		below a predefined poverty			
		line.			
		(Échevin 2011, 5)			
Household	Yes	an extension of this empirical	Yes		Table 2 presents summary statistics for variables used in
	162	framework will consist in using	162		the analysis. Consumption and as
level					
		two-level (i.e. household and			income are expressed in Gourdes. The agricultural index

		community levels) modelling of the impact of those shocks following Günther and Harttgen (2009)'s approach. (Échevin 2011, 3)			is a composite indicator which is a linear combination of categorical variables obtained from a multiple correspondence analysis (cf. Asselin, 2009). Variables considered in the analysis are the number of lands, animals and agricultural materials owned by the household. The community index is a linear combination of community basic infrastructure and access to market variables (roads, access to elementary or secondary schools, health centres, markets, electricity and cell phone). A score of income diversity has also been built from the various income sources earned by the household. As four main income sources are declared by the household, the income diversity variable (ID) is defined 4 IDi = 2 1 $2 -1 \sum (s) 2$, where k k 2 2 2 is is the share of the kth income source in total income of household i. This score equals 0 when only one source of income is declared by the household. It averages 0.17 in the studied population. (Échevin 2011, 10)
Idiosyncratic shocks	No				
Observable covariate shocks	No				
Observable idiosyncratic shocks	No				
Poverty	Yes	In order to fully characterize the determinants of poverty and vulnerability in rural Haiti, a	No	Economic well- being	

		unique survey can be used to assess the impact of idiosyncratic and covariate shocks on economic well-being (Échevin 2011, 3)			
Unobservable covariate shocks	No				
unobservable idiosyncratic shocks	No				
vulnerability	Yes	Following Chaudhuri et al. (2002) or Christiaensen and Subbarao (2005), it will be possible to provide estimates of household vulnerability to poverty considering these various components (Échevin 2011, 3, 4)	No	Household vulnerability to poverty	

Article: (Ford and	Article: (Ford and Smit 2004)							
<u>Construct</u>	Defined?	<u>Definition or further info</u>	Directly Operationalized?	Indirectly operationalized through:	<u>Operational text</u>			
current adaptive capacity	Yes/no	Adaptive capacity refers to a community's potential or ability to address, plan for, or adapt to exposure (Smit and Pilifosova, 2003). Most communities can cope with normal climatic conditions and a range of deviations around norms. People have learned to modify their behaviour and their environment to manage and take advantage of their local climatic conditions (Jones and Boer, 2003). This ability to cope is referred to in the literature as the "coping range"; it	No	Current vulnerability				

	reflects resource use options and risk			
	management strategies to prepare for,			
	avoid or moderate, and recover from			
	exposure effects (Hewitt and Burton,			
	1971; Smit et al., 1999; Jones, 2001;			
	Smit and Pilifosova, 2003). Adaptive			
	capacity relates to communities'			
	resilience, resistance, flexibility, and ro-			
	bustness (Smithers and Smit, 1997). It is			
	influenced by economic wealth, social			
	networks, infrastructure, social in-			
	stitutions, social capital, experience			
	with previous risk, the range of			
	technological adaptation available, and			
	equity of access to resources within the			
	community, as well as by other stresses			
	that contribute to the environment in			
	which decisions are made (Adger and			
	Kelly, 1999; Smit and Pilifosova, 2001;			
	Smith et al., 2003).			
	(Ford and Smit 2004, 393)			
Current	Exposure is a property of a community	No	Current	
exposure	relative to climatic conditions. It reflects		vulnerability	
	both the nature of the climatic			
	conditions and nature of the			
	community itself. Some communities			
	may be exposed to a particular climate			
	event whereas the same event may not			
	affect another community. Climatic			
	characteristics include magnitude,			
	frequency, spatial dispersion, duration,			
	speed of onset, and temporal spacing of			
	climatic risks, relating to tem-			
	peratures, precipitation, and wind. The			
	nature of the com- munity concerns its			
	location relative to the climatic risks			
	(Ford and Smit 2004, 393)			
Current		Vec		experience, and the traditional and local
Current	The assessment of current vulnerability	yes		experience, and the traditional and local

vulnerability	requires analyzing and documenting	knowledge of community members (Inuit
	communities' experiences with climatic	Qaujimajatuqangit) are cen- tral to
	risks (current exposure) and the	assessing current vulnerability. Indigenous
	adaptive options and resource	populations possess detailed knowledge of
	management strategies employed to	their environ- ment built up through
	address these risks (current adaptive	personal observation and experience and
	capacity).	from shared experience of members of the
	(Ford and Smit 2004, 395)	community (Duerden and Kuhn, 1998;
		Huntington, 1998; Usher, 2000). Knowledge
		about the environment and its use can be
		employed to identify and reconstruct
		events and condi- tions that represent
		climatic risks to the community and to
		provide insights into the resource-use
		options and risk- management strategies
		employed to prepare for, avoid or
		moderate, and recover from the effects of
		exposure. Such knowledge can be gained
		through several estab- lished ethnographic
		techniques, including focus groups,
		interviews, and participant observation.
		These techniques have been successfully
		used in research documenting indigenous
		observations on climate and environmental
		change throughout Arctic North America
		(Ferguson et al., 1998; Huntington, 1998;
		Krupnik and Jolly, 2002; DSD, 2003). Inuit
		Qaujimajatuqangit has also been
		documented to show how communities are
		adapting to changes and to identify
		adaptation needs (Fox, 2002; Nickels et al.,
		2002; DSD, 2003; Government of Nunavut,
		2003). Information on risks and adaptation
		strategies can also be derived from content
		analysis of government reports, newspaper
		articles, Hudson Bay Company postal
		records, Distant Early Warning Site reports,
		and the insights of experienced land and

				resource use managers (Duerden, 2001). Solomon and Hart (1999) used Hudson Bay Com- pany postal records and ships' logbooks to examine storm frequency and severity in the Beaufort Sea. Fienup- Riordan (1999) used Catholic mission records and letters between government officials to assess the nature and impacts of a storm surge in 1931 in southwestern Alaska. (Ford and Smit 2004, 396)
future adaptive capacity		Future adaptive capacity concerns the degree to which the community can deal with the estimated future exposures (Ford and Smit 2004, 396)	yes	Future adaptive capacity concerns the degree to which the community can deal with the estimated future exposures. By examining past responses to climate variability and extremes and having the commu- nity identify its future adaptation options and constraints, researchers can characterize a community's ability to cope with future changes and collaborate to identify adaptive strategies that will reduce risk. (Ford and Smit 2004, 396)
future climate	no			
probabilities future exposure		Future exposure also includes estimating the future state of the socioeco- nomic conditions, given that exposure is a property of the system relative to risk. (Ford and Smit 2004, 396)	yes	Assessing future exposure involves collaboration with the climate science community to estimate the likelihood of changes in cli- matic attributes identified by the community. For exam- ple, will extreme events or climatic variability continue to increase? Will the unexpected winds that have caused problems to hunters in many Nunavut communities be- come even stronger and less predictable? Will the storm surges that have damaged infrastructure and sea defenses increase in magnitude or frequency? Which areas will

future social probability	No				experience most exposure to erosion? Future exposure also includes estimating the future state of the socioeco- nomic conditions, given that exposure is a property of the system relative to risk. (Ford and Smit 2004, 396)
Future vulnerability		Future vulnerability is assessed by analyzing how cli- mate change will alter the nature of the climate-related risks and whether the communities' coping strategies will have the capacity to deal with these risks. Assessing future exposure involves collaboration with the climate science community to estimate the likelihood of changes in cli- matic attributes identified by the community (Ford and Smit 2004, 396)	No	Future exposure; future adaptive capacity	
vulnerability to climate risks		The conceptual model of community vulnerability to climate change outlined here builds on the literature, conceptualizing vulnerability as a function of exposure of the community to climate-change effects and its adaptive capacity to deal with that exposure. (Ford and Smit 2004, 393) [] A research framework for empirically applying the model of vulnerability proposed above to Arctic commu- nities is illustrated in Figure 3. The first stage assesses current vulnerability by documenting current exposures and current adaptive strategies. The second stage assesses future vulnerability by	No	Current vulnerability; future vulnerability	

estimating directional changes in exposure and predicting future adaptive		
capacity on the basis of past behavior. (Ford and Smit 2004, 395)		

Article: (Füssel a	nd Klein 2006	5)			
<u>Construct</u>	Defined?	Definition or further info	Directly Operationalized?	Indirectly operationalized through:	Operational text
Adaptation	Yes	Adaptation: Adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities. Various types of adaptation can be distinguished, including anticipatory and reactive adaptation, private and public adaptation, and autonomous and planned adaptation. [] Adaptation to climate change, as defined by the IPCC, comprises a broad range of actions. Alternative definitions have sometimes restricted the use of this term to adjustments in social systems, to deliberate changes, to major structural changes in a system, or to a subset of climatic stimuli (Smit et al., 2000) (Füssel and Klein 2006, 318)	not operationalized	[name of construct]	
Adaptatoin- Facilitation	Yes	Facilitation refers to activities that enhance adaptive capacity, such as scientific research, data collection, awareness raising, capacity building, and the establishment of institutions, information networks, and legal frameworks for action. (Füssel and Klein 2006, 323)	not operationalized		
Adaptation- implmentation	Yes	Implemen- tation refers to activities that actually avoid adverse climate impacts on a sys- tem by reducing its exposure or sensitivity to climatic hazards, or by moderating relevant non-climatic factors (see Section 3.4 for examples). (Füssel and Klein 2006, 323)	not operationalized		

Adaptive	Yes	Adaptive capacity: The ability of a system to adjust to	not	
capacity		climate change (in- cluding climate variability and	operationalized	
		extremes) to moderate potential damages, to take		
		advantage of opportunities, or to cope with the		
		consequences.		
Climata abanga	Vaa	(Füssel and Klein 2006, 319)		
Climate change	Yes	Climate change: A statistically significant variation in either	not	
		the mean state of the climate or in its variability, persisting	operationalized	
		for an extended period (typically decades or longer). [] (Füssel and Klein 2006, 313)		
Climate	Yes	Climate variability: Variations in the mean state and other	not	
variability		statistics (such as standard deviations, the occurrence of	operationalized	
		extremes, etc.) of the climate on all temporal and spatial		
		scales beyond that of individual weather events. Vari-		
		ability may be due to natural internal processes within the		
		climate system (internal variability), or to variations in		
		natural or anthropogenic external forcing (external		
		variability).		
		(Füssel and Klein 2006) 316 (Füssel and Klein 2006, 316)		
concentrations	No			
Emissions	No			
Exposure	Yes	Exposure: The nature and degree to which a system is	not	
		exposed to significant climatic variations.	operationalized	
		The exposure of a system to climate stimuli depends on		
		the level of global cli- mate change and, due to the spatial		
		heterogeneity of anthropogenic climate change, on the		
		system's location		
luciona etc	Vaa	(Füssel and Klein 2006, 313)		
Impacts	Yes	Impacts: Consequences of climate change on natural and	not	
		human systems. Depending on the consideration of adaptation, one can distinguish between potential and	operationalized	
		residual impacts. []		
		(Füssel and Klein 2006, 314)		
Mitigation	Yes	Mitigation: An anthropogenic intervention to reduce the	not	
Micigation	103	sources or enhance the sinks of greenhouse gases.	operationalized	
		(Füssel and Klein 2006, 317)	operationalized	
Mitigative	Yes	The concept of mitigative capacity has been introduced	not	
		into the literature only recently (Yohe, 2001). Mitigative	operationalized	

Mitigation Faciliation	Yes	capacity is affected by various non-climatic factors. For instance, the effectiveness of a carbon trading scheme in reducing greenhouse gas emissions is partly determined by the presence and effectiveness of appropriate institutional arrangements in the respective region. (Füssel and Klein 2006, 323) The mitigative capacity of a region, sector, or other social unit may be enhanced by facilitation measures, such as the establishment of a carbon trading scheme. (Füssel and Klein 2006, 323)	not operationalized	
Mitigation- implementation	Yes	An example for an implementation measure is the replacement of an old power plant by a less carbon- intensive one, which may have become economically viable due to the possibility for trading carbon permits. (Füssel and Klein 2006, 323)	not operationalized	
Non-climatic drivers	Yes	non-climatic drivers (e.g., demographic, economic, sociopolitical, technological, and biophysical drivers). These drivers affect relevant non-climatic factors (e.g., the degree of economic diversification, the level of edu- cation, and the strength of social networks) that, in turn, determine the sensitivity of a system or community to climate change. In the context of climate change vul- nerability assessments, large-scale processes associated with global change, such as economic globalization and urbanization, are particularly important. (Füssel and Klein 2006, 320)	not operationalized	
Non-climatic factors	Yes	Generic determinants of adaptive capacity in social systems comprise such non-climatic factors as economic resources, technology, information and skills, infrastructure, institutions, and equity (Smit and Pilifosova, 2001; Yohe and Tol, 2002). (Füssel and Klein 2006, 320)	not operationalized	
Sensitivity	Yes	Sensitivity: The degree to which a system is affected, either adversely or beneficially, by climate-related stimuli. [] The effect may be direct []or indirect [] [] The sensitivity of a system denotes the (generally multi- factorial and dynamic) dose – response relationship	not operationalized	

		between its exposure to climatic stimuli and the re- sulting impacts. (Füssel and Klein 2006, 314)		
Vulnerability	Yes	Vulnerability: The degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate variation to which a system is exposed, its sensitivity, and its adaptive capacity. (Füssel and Klein 2006, 306)	not operationalized	

Article: (Gandu	Article: (Gandure, Walker, and Botha 2013)								
<u>Construct</u>	Defined?	Definition or further info	Directly Operationalized?	Indirectly operationalized through:	Operational text				
Actual meterological observation	Yes	actual meteorological observations, rainfall and temperature data obtained from the South Africa Weather Services were analysed. Rainfall and air temperature are routinely measured at various stations distributed across South Africa, although not all districts have weather stations. (Gandure, Walker, and Botha 2013, 42)	Yes		rainfall and temperature data obtained from the South Africa Weather Services were analysed. Rainfall and air temperature are routinely measured at various stations distributed across South Africa, although not all districts have weather stations. Rainfall data for our analysis was obtained from the station at Thaba Nchu; for temperature; the Bloemfontein station data was used due to lack of such data for Thaba Nchu. Temperature data for Bloemfontein provided a near representation of climate conditions in Thaba Nchu. Trends of the recorded rainfall and temperature data over the last 49 years (1960–2009) were analysed to determine how scientific observations and farmers' experiences interrelate and to understand the factors influencing community experiences. (Gandure, Walker, and Botha 2013, 42)				
Adaptation to long term	Yes	Unique in our study, is the use of individual perceptions in	Yes		Open ended questions were used to seek information on actions farmers take to adapt to				

climate change		identifying and understanding the processes of adaptation in an area that has undergone significant political and socio- economic reformation resulting from a series of conflicts over land resources. (Gandure, Walker, and Botha 2013, 40)		perceived changes in temperature and rainfall and whether these actions were temporary or permanent. Firstly, farmerswere askedwhether they had changed theirway of life due to climate change. If the answerwas yes, then follow up questions of how they had changed andwhether they felt the changewas temporary or permanent were asked. If the answer was no, the reason(s) for not changing were then probed. (Gandure, Walker, and Botha 2013, 42)
Climatic risk factors	No			
Experience of long term climate change	Yes	The study relied on the experience and knowledge of farmers and community members in Gladstone to characterise their livelihood risks fromclimatic and non-climatic risk factors. (Gandure, Walker, and Botha 2013, 41)	Not operationalized	
Livelihood risks	No			
Non-climatic risk factors	No			
Perception of long term climate change	Yes	Unique in our study, is the use of individual perceptions in identifying and understanding the processes of adaptation in an area that has undergone significant political and socio- economic reformation resulting from a series of conflicts over land resources. (Gandure, Walker, and Botha 2013, 40)	Yes	Farmers' perceptions were sought by means of open ended questions on their observations/ experiences of long-term changes in temperature and/or rainfall. For temperature, farmers' opinions were sought on whether it has become warmer, cooler, more extreme, or no change noted. They could also report any other characteristics noted or say they did not know. Similarly, rainfall could be perceived as wetter, drier, more extreme, no change noted, other characteristics noted or admit to having no knowledge. Additional questions were asked on the manner in which changes occurred and farmers'

		perceptions of these changes.
		(Gandure, Walker, and Botha 2013, 42)

Construct	Defined?	Definition or further info	Directly	Indirectly	Operational text
			Operationalized?	operationalized	<u> </u>
			<u>operationalizea.</u>	through:	
Community level	Yes	Multilevel models are designed to analyze the relationship between variables that are measured at different hierarchical levels (for an introduction see, e.g., Bryk & Raudenbush, 1992; Goldstein, 1999; Hox, 2002). We speak of "hierarchical" or "multilevel" data structure whenever variables are collected at different hierarchical levels with lower-levels (e.g., house- holds) nested within higher-levels (e.g., communities). (Günther and Harttgen 2009, 1225)	Yes		The community census is the 2001 ILO/Cornell Commune Level census which covers 1,385 of the 1,395 communities in Mada- gascar. The community survey provides information on community characteristics such as social and economic infrastructure as well as data on the occurrence of some limited number of covariate shocks. More precisely, for each community and for the three years preceding the survey (2001, 2000, 1999) it is reported whether the community was exposed to any of 16 covariate shocks (most of these are reported in Tables A.1 and A.2 in Appendix). In many studies, the village has been used as the "natural" covariate level, but there is no necessity to do so (Genicot & Ray, 2003; Morduch, 2005), and using communities instead, as we do in this analysis, does not seem less useful. (Günther and Harttgen 2009, 1227)
Covariate shocks	Yes	Households in developing countries are	yes		More precisely, for each

		frequently hit by se- vere idiosyncratic and covariate shocks resulting in high income volatility. 1 (Günther and Harttgen 2009, 1222) [] 1. Here, and in the following, idiosyncratic shocks refer to household- specific shocks (e.g., injury, birth, death, or job loss of a household member) that are only weakly correlated across households within a community. Covariate shocks refer to shocks that are correlated across households within communities but only weakly correlated across communities (e.g., natural disasters or epidemics). (Günther and Harttgen 2009, 1231)		community and for the three years preceding the survey (2001, 2000, 1999) it is reported whether the community was exposed to any of 16 covariate shocks (most of these are reported in Tables A.1 and A.2 in Appendix). (Günther and Harttgen 2009, 1227)
Household level	Yes	Multilevel models are designed to analyze the relationship between variables that are measured at different hierarchical levels (for an introduction see, e.g., Bryk & Raudenbush, 1992; Goldstein, 1999; Hox, 2002). We speak of "hierarchical" or "multilevel" data structure whenever variables are collected at different hierarchical levels with lower-levels (e.g., house- holds) nested within higher-levels (e.g., communities). (Günther and Harttgen 2009, 1225)	Yes	Data on household characteristics are taken from the na- tional representative household survey of 2001 (Enque^te Aupre`s Des Me´nages), covering 5,080 households (1,778 ur- ban and 3,302 rural households) in 186 communities. [] To estimate households' expected mean and variance in con- sumption, we first use the household characteristics in Table 1. In addition, we consider an agricultural asset index (composed of eight productive assets) estimated via principal component analysis (Filmer & Pritchett, 2001). At the community level, we include population density, mean

					educational level, the per- centage of households working in the formal sector and the percentage of households possessing an enterprise within the community. Moreover, we construct an infrastructure index, again based on principal component analysis, using fourteen characteristics reflecting the infrastructure of the community (see Table A.4 in Appendix). (Günther and Harttgen 2009, 1227)
Household vulnerability to poverty	Yes	The suggested approach is an integration of multilevel analysis (e.g., Goldstein, 1999) into Chaudhuri's (2002) method to estimate vulnerabil- ity (Günther and Harttgen 2009, 1223)	No	Risk-induced vulnerability; household level	
Idiosyncratic shocks	Yes	Households in developing countries are frequently hit by se- vere idiosyncratic and covariate shocks resulting in high income volatility. 1 (Günther and Harttgen 2009, 1222) [] 1. Here, and in the following, idiosyncratic shocks refer to household- specific shocks (e.g., injury, birth, death, or job loss of a household member) that are only weakly correlated across households within a community. Covariate shocks refer to shocks that are correlated across households within communities but only weakly correlated across communities (e.g., natural disasters or epidemics).	Yes		shocks (most of these are reported in Tables A.1 and A.2 in App (Günther and Harttgen 2009, 1227)

		(Günther and Harttgen 2009, 1231)			
Risk-induced poverty	Yes	 Here, and in the following, idiosyncratic shocks refer to household- specific shocks (e.g., injury, birth, death, or job loss of a household member) that are only weakly correlated across households within a community. Covariate shocks refer to shocks that are correlated across households within communities but only weakly correlated across communities (e.g., natural disasters or epidemics). (Günther and Harttgen 2009, 1231) 	No	Idiosyncratic shocks; covariate shocks	
Structural poverty	Yes	Moreover, these poverty measures cannot assess whether high poverty rates are a cause of structural poverty (i.e., low endowments) or a cause of poverty risk (i.e., high uninsured income fluctuations), which is important to know from a policy perspective. (Günther and Harttgen 2009, 1222)	Yes		st, we decompose vulnerability estimates into the sources of vulnerability. We first analyze whether vulnerability is mainly driven by permanent low consumption prospects (i.e., structural or poverty induced vulnerability) or by high consumption volatility (i.e., transitory or risk induced vulner- ability). 18 In other words, if the (estimated) expected mean consumption ln^ a high estimated variance in consumption ^r2 mated vulnerability that is greater than the set vulnerability threshold of 0.29, then the household is said to face risk in- duced vulnerability (Figure 1) (Günther and Harttgen 2009, 1229)

Article: (Hahn, Riederer, and Foster 2009)							
<u>Construct</u>	Defined?	Definition or further info	<u>Directly</u>	<u>Indirectly</u>	Operational text		

			Operationalized	operationalized	
			?	through:	
2 week illness	Yes	Percentage of households that report at least 1 family member who had to miss school of work due to illness in the last 2 weeks. (Hahn, Riederer, and Foster 2009, 77)	Yes	[name of construct]	Has anyone in your family been so sick in the past 2 weeks that they had to miss work or schoo (Hahn, Riederer, and Foster 2009, 77)
Adaptive capacity	Yes	adaptive capacity is the system's ability to withstand or recover from the exposure (Ebi et al., 2006). (Hahn, Riederer, and Foster 2009, 75)	No	Socio-demographic profile; livelihood strategies; social network	
agriculture dependend households	Yes	Percentage of households that report only agriculture as a source of income. (Hahn, Riederer, and Foster 2009, 77)	Yes		Do you or someone else in your household raise animals? Do you or someone else in your household grow crops? Do you or someone else in your household collect something from the bush, the forest, or lakes and rivers to sell? (Hahn, Riederer, and Foster 2009, 77)
average precipitation	Yes	Standard deviation of the average monthly precipitation between 1998 and 2003 was averaged for each province (Hahn, Riederer, and Foster 2009, 79)	Yes		1998–2003: provincial data; weather station based in the provincial capital (Hahn, Riederer, and Foster 2009, 79)
borrow-lend ratio	Yes	Ratio of a household borrowing money in the past month to a household lending money in the past month, e.g., If a household borrowed money but did not lend money, the ratio = 2:1 or 2 and if they lent money but did not borrow any, the ratio = 1:2 or 0.5. (Hahn, Riederer, and Foster 2009) (Hahn, Riederer, and Foster 2009, 78)	Yes		Did you borrow any money from relatives or friends in the past month? Did you lend any money to relatives or friends in the past month? (Hahn, Riederer, and Foster 2009) (Hahn, Riederer, and Foster 2009, 78)
crop diversity	Yes	The inverse of (the number of crops grown by a household +1). e.g., A household that grows pumpkin, maize,	Yes		What kind of crops does your household grow? (Hahn, Riederer, and Foster 2009)

		hhemba beans, and cassava will have a Crop Diversity Index = 1/(4 + 1) = 0.20. (Hahn, Riederer, and Foster 2009) (Hahn, Riederer, and Foster 2009, 78)			(Hahn, Riederer, and Foster 2009, 78)
dependency ratio	Yes	Ratio of the population under 15 and over 65 years of age to the population between 19 and 64 years of age. (Hahn, Riederer, and Foster 2009, 77)	Yes		Could you please list the ages and sexes of every person who eats and sleeps in this house? If you had a visitor who ate and slept here for the last 3 days, please include them as well. (Hahn, Riederer, and Foster 2009, 77)
don't save crops	Yes	Percentage of households that do not save crops from each harvest. (Hahn, Riederer, and Foster 2009) (Hahn, Riederer, and Foster 2009, 78)	Yes		Does your family save some of the crops you harvest to eat during a different time of year? (Hahn, Riederer, and Foster 2009) (Hahn, Riederer, and Foster 2009, 78)
don't save seeds	Yes	Percentage of households that do not have seeds from year to year. (Hahn, Riederer, and Foster 2009) (Hahn, Riederer, and Foster 2009, 78)	Yes		Does your family save seeds to grow the next year? (Hahn, Riederer, and Foster 2009)
Exposure	Yes	Exposure in this case is the magnitude and duration of the climate-related exposure such as a drought or change in precipitation, (Hahn, Riederer, and Foster 2009, 75)	No	Natural disaster and climate change	
family with cronic illness	Yes	Percentage of households that report at least 1 family member with chronic illness. Chronic illness was defined subjectively by respondent. (Hahn, Riederer, and Foster 2009, 77)	Yes		Is anybody in your family chronically ill (they get sick very often)? (Hahn, Riederer, and Foster 2009, 77)
flood, drought, cyclone events	Yes	Total number of floods, droughts, and cyclones that were reported by households in the past 6 years. (Hahn, Riederer, and Foster 2009, 79)	Yes		How many times has this area been affected by a flood/cyclone/drought in 2001– 2007? (Hahn, Riederer, and Foster 2009, 79)

Food food from family	Yes	Food from family farm; struggle for food; crop diversity; dont save crops; dont save seeds (Hahn, Riederer, and Foster 2009) (Hahn, Riederer, and Foster 2009, 78) Percentage of households that get their	No Yes	Food from family farm; struggle for food; crop diversity; dont save crops; dont save seeds	Where does your family get most
farm		food primarily from their personal farms (Hahn, Riederer, and Foster 2009) (Hahn, Riederer, and Foster 2009, 78)			of its food? (Hahn, Riederer, and Foster 2009) (Hahn, Riederer, and Foster 2009, 78)
Health	Yes	Proximity to health facility; 2 weeks illness; malaria-exposure-prevention (Hahn, Riederer, and Foster 2009, 77)	No	Family with chronic illness; proximity to health facility; 2 weeks illness; malaria exposure- prevention	
households with orphans	Yes	Percentage of households that have at least 1 orphan living in their home. Orphans are children<18 years old who have lost one or both parents. (Hahn, Riederer, and Foster 2009, 77)	Yes		Are there any children less than 18 years old from other families living in your house because one or both of their parents has died? (Hahn, Riederer, and Foster 2009, 77)
households working elsewhere	Yes	Percentage of households that report at least 1 family member who works outside of the community for their primary work activity (Hahn, Riederer, and Foster 2009, 77)	Yes		How many people in your family go to a different community to work? (Hahn, Riederer, and Foster 2009, 77)
idendependent of local government	Yes	Percentage of households that reported that they have not asked their local government for any assistance in the past 12 months. (Hahn, Riederer, and Foster 2009) (Hahn, Riederer, and Foster 2009, 78)	Yes		In the past 12 months, have you or someone in your family gone to your community leader for help (Hahn, Riederer, and Foster 2009) (Hahn, Riederer, and Foster 2009, 78)
inconsistent water suply	Yes	Percentage of households that report that water is not available at their primary water source everyday (Hahn, Riederer, and Foster 2009, 79)	Yes		Is this water available everyday? (Hahn, Riederer, and Foster 2009, 79)
injury or death from	Yes	Percentage of households that reported	Yes		Was anyone in your family injured

disaster		either an injury to or death of one of their family members as a result of the most severe flood, drought, or cyclone in the past 6 years. (Hahn, Riederer, and Foster 2009, 79)			in the flood/cyclone drought? Did anyone in your family die during the flood/cyclone/drought? (Hahn, Riederer, and Foster 2009, 79)
inverse water stored	Yes	The inverse of (the average number of liters of water stored by each household + 1). (Hahn, Riederer, and Foster 2009, 79)	Yes		What containers do you usually store water in? How many? How many liters are they? (Hahn, Riederer, and Foster 2009, 79)
livelihood diversification	Yes	The inverse of (the number of agricultural livelihood activities +1) reported by a household, e.g., A household that farms, raises animals, and collects natural resources will have a Livelihood Diversification Index = 1/(3 + 1) = 0.25. (Hahn, Riederer, and Foster 2009, 77)	Yes		Do you or someone else in your household raise animals? Do you or someone else in your household grow crops? Do you or someone else in your household collect something from the bush, the forest, or lakes and rivers to sell? (Hahn, Riederer, and Foster 2009, 77)
Livelihood strategies	Yes	Household working elsewhere; agriculture dependent households; livlihood diversification (Hahn, Riederer, and Foster 2009, 77)	No	Households working elsewhere; agriculture dependent household; livelihood diversification	
Livelihood vulnerability	Yes	The LVI includes seven major components: Socio-Demographic Profile, Livelihood Strategies, Social Networks, Health, Food, Water, and Natural Disasters and Climate Variability (Hahn, Riederer, and Foster 2009, 76)	No	Socio-demographic profile; livelihood strategies; social networks; health; food; water; natural disaster and climate change	
malaria exposure- prevention	Yes	Months reported exposure to malaria*Owning at least one bednet indicator (have bednet = 0.5, no bednet = 1) (e.g., Respondent reported malaria	Yes		Which months of the year is malaria particularly bad? How many mosquito nets do you have? (Hahn, Riederer, and Foster 2009,

maximum	Yes	is a problem January–March and they do not own a bednet = 3*1 = 3). (Hahn, Riederer, and Foster 2009, 77) Standard deviation of the average daily	Yes		77) 1998–2003: provincial data;
temperature	Tes	maximum temperature by month between 1998 and 2003 was averaged for each provinceb (Hahn, Riederer, and Foster 2009, 79)	res		weather station based in the provincial capital (Hahn, Riederer, and Foster 2009, 79)
minimum temperature	Yes	Standard deviation of the average daily minimum temperature by month between 1998 and 2003 was averaged for each province. (Hahn, Riederer, and Foster 2009, 79)	Yes		1998–2003: provincial data; weather station based in the provincial capital (Hahn, Riederer, and Foster 2009, 79)
Natural disasters and Climate variability	Yes	Sub-constructs: flood, drought, cyclone events; no warning of disaster; injury or death from disaster; maximum temperature; minimum temperature; average percipitatoin (Hahn, Riederer, and Foster 2009, 79)	No	Flood, drought, cyclone events; injury or death from disaster; no warning of disaster; maximum temperature; minimum temperature; average precipitation	
natural water source	Yes	Percentage of households that report a creek, river, lake, pool, or hole as their primary water source. (Hahn, Riederer, and Foster 2009, 79)	Yes		Where do you collect your water from? (Hahn, Riederer, and Foster 2009, 79)
no warning of disaster	Yes	Percentage of households that did not receive a warning about the most severe flood, drought, and cyclone event in the past 6 years. (Hahn, Riederer, and Foster 2009, 79)	Yes		Did you receive a warning about the flood/cyclone/drought before it happened? (Hahn, Riederer, and Foster 2009, 79)
precent of female- headed households	Yes	Percentage of households where the primary adult is female. If a male head is away from the home >6 months per year the female is counted as the head of the household	Yes		Are you the head of the household? (Hahn, Riederer, and Foster 2009, 77)

		(Hahn, Riederer, and Foster 2009, 77)			
proximity to health facility	Yes	Average time it takes the households to get to the nearest health facility. (Hahn, Riederer, and Foster 2009, 77)	Yes		Howlong does it take you to get to a health facility? (Hahn, Riederer, and Foster 2009, 77)
proximity to water source	Yes	Average time it takes the households to travel to their primary water source. (Hahn, Riederer, and Foster 2009, 79)	Yes		How long does it take to get to your water source? (Hahn, Riederer, and Foster 2009, 79)
receive-give ratio	Yes	Ratio of (the number of types of help received by a household in the past month + 1) to (the number of types of help given by a household to someone else in the past month + 1). (Hahn, Riederer, and Foster 2009) (Hahn, Riederer, and Foster 2009, 78)	Yes		In the past month, did relatives or friends help you and your family: (e.g., Get medical care or medicines, Sell animal products or other goods produced by family, Take care of children) In the past month, did you and your family help relatives or friends: (same choices as above) (Hahn, Riederer, and Foster 2009) (Hahn, Riederer, and Foster 2009, 78)
Sensitivity	Yes	sensitivity is the degree to which the system is affected by the exposure (Hahn, Riederer, and Foster 2009, 75)	No	Food; health; water	
social networks	Yes	Receive-give ration; borrow-lend ration; independent of local government (Hahn, Riederer, and Foster 2009) (Hahn, Riederer, and Foster 2009, 78)	No	Receive-give ration; borrow-lend ration; indenpendent of loval government	
Socio-demographic profile	Yes	Dependency ratio; female headed households; uneducated headed households; households with orphans (Hahn, Riederer, and Foster 2009, 77)	No	Dependency ratio; percent of female headed households; households with orphans; uneducated headed households	
struggle for food	Yes	Average number of months households struggle to obtain food for their family. (Hahn, Riederer, and Foster 2009)	Yes		Does your family have adequate food the whole year, or are there times during the year that your

		(Hahn, Riederer, and Foster 2009, 78)			family does not have enough food? Howmanymonths a year does your family have trouble getting enough food? (Hahn, Riederer, and Foster 2009) (Hahn, Riederer, and Foster 2009, 78)
uneducated headed households	Yes	Percentage of households where the head of the household reports that they have attended 0 years of school (Hahn, Riederer, and Foster 2009, 77)	Yes		Did you ever go to school? (Hahn, Riederer, and Foster 2009)
Vulnerability ipcc	Yes	Many of these rely heavily on the IPCC working definition of vulnerability as a function of exposure, sensitivity, and adaptive capacity (IPCC, 2001). (Hahn, Riederer, and Foster 2009, 75)	No	Exposure; Sensitivity; Adaptive capacity	
Water	Yes	Sub-constructs: water conflict; natural water source; proximity to water source; inconsistent water supply; inverse water storage (Hahn, Riederer, and Foster 2009, 79)	No	Water conflict; natural water source; proximity to water source; inconsistent water supply; inverse water stored	
water conflict	Yes	Percentage of households that report having heard about conflicts over water in their community (Hahn, Riederer, and Foster 2009, 79)	Yes		In the past year, have you heard about any conflicts over water in your community? (Hahn, Riederer, and Foster 2009, 79)

Article: (lonesco et al. 2009)									
<u>Construct</u>	Defined?	Definition or further info	Directly	Indirectly	Operational text ²⁹				
			Operationalized?	operationalized through:					

²⁹ For the purposes of illustration, lonesco et al operationalized their framework on two different data sets. Therefore, 2 operationalizations are coded for each directly operationalizable construct

adaptive	no				
capacity					
adaptive capacity as set	Yes	Definition (Adaptive capacity as a set) The adaptive capacity of a system f in state x subjected to an input e is represented by the set of its effective actions. (Ionesco et al. 2009, 9)	Yes		The adaptive capacity index can be seen within our framework as an estimate of the size of the set of available actions Uk. The socio-economic data used to derive the index (e.g.,GDPper capita, literacy rate and labour participation rate of women) indicate the capac- ity of society to prepare for and respond to impacts of global change by choosing an appropriate action (i.e., ecosystem management strategy). The size of this set of actions can be assumed to be an indication of the size of the set of effective actions, since the latter is a subset of the former. (Ionesco et al. 2009, 13) [] In contrast toATEAM,the transition function of the coupled human–environment system was known and has the form of Eq. 19. In addition to the input, controls (i.e., adaptation actions) were included in the model. The actions contained in the set of controls U were (1) do nothing, (2) build dikes, (3) move away and (4) nourish the beach or tidal basins. (Ionesco et al. 2009, 13)
effective action	Yes	Definition (Effective action) An action u is effective for a system f in state x subjected to an input e if not (f (x, e,u) \prec f (x, e*,u*)). (Ionesco et al. 2009, 9)	No	adaptive capacity as set	
Entity	Yes	The mainstream mathematical interpretation of an entity is that of a dynamical system in a given state. This is the interpretation we will adopt here	Yes		When taking a closer look at ATEAM using the formal framework of Section 3, we first need to identify the framework's three

		(Ionesco et al. 2009, 4)		primitives. ATEAM aimed "to assess where in Europe people may be vulnerable to the loss of particular ecosystem services, associated with the combined effects of climate change, land use change and atmospheric pollution" ([22], p. 3). Thus, the entity is a coupled human–ecological system: the people in Europe who rely on ecosystem services. The system receives both input (the stimuli) and controls (the human actions). The evolution of such a system can be given by xk+1 = f(xk, ek, uk), (19) where k denotes the time step and uk is an element of the set of available controls Uk, which are the man- agement actions people can apply to adapt to poten- tial impacts and, thus, maintain the ecosystem services on which they rely. These actions are usually specific to the ecosystem service considered. (lonesco et al. 2009, 12) [] The first primitive, the vulnerable entity, is
				the coastal system.
hazard potential	Yes	Definition (Hazard, potential impact) An	Not	(lonesco et al. 2009, 13)
impact	105	input $e \in E$ is a hazard for a system f in state x if $\exists u \in U$: f (x, e,u) \prec f (x, e*,u*). In this case, f (x, e,u) is called a potential impact. (Ionesco et al. 2009, 8)	operationalized	
preference criteria	Yes	Preference criteria are used to ascertain whether or not a possible evolution of the entity is "bad" or "good". In the examples we have considered, we have seen that this judgment is usually made by	Yes	The third primitive notion concerns the preference criteria represented by a (partial) strict order ≺,which relate to the loss of ecosystem services.We will discuss the preference criteria in more detail

		comparison with a "normal" evolution, or an evolution under a "zero input". (Ionesco et al. 2009, 5)		([] ; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ;	below. (Ionesco et al. 2009, 12) [] The third primitive, the partial strict order was given in the form of an impact function on the set of states. The function computes additional diagnostic properties such as people at risk of flooding, land loss, economic damages and the cost of protecting the coast. (Ionesco et al. 2009, 13)
reference scenarios	Yes	The examples provided also have this "punctual" or "one-step" character. However, in many applications, it is more natural to consider an evolution of the system to be a sequence of states, and to consider scenarios and reference scenarios instead of punctual inputs for the vulnerability assessment. A scenario is just a sequence of inputs: es =[e1, e2,, en]. Corresponding to such a sequence, the sys- tem will undergo n transitions, xs =[x0, x1,, xn] (lonesco et al. 2009, 7)	Yes	r i c c c c c c c c c c c c c c c c c c	To allow for such comparisons was one of the main objectives of ATEAM. Depending on the purposes of the assessment, the reference input could be chosen to be "no input", that is, the next state was compared to the current one, or one of the other inputs prepared in accordance to the SRES scenarios. (Ionesco et al. 2009, 12)
relative hazards	Yes	Definition (Relative hazard) An input $e \in$ E is a rela- tive hazard for a system f in state x relative to an action $u \in U$ if f (x, e,u) \prec f (x, e*,u*). (Ionesco et al. 2009, 8)	Not operationalized		
Stimulus	Yes	The stimuli to which such a system can be subjected are then naturally represented by the inputs to the system. The simplest kind of dynamical system with input is a discrete, deter- ministic one, given by a transition function (see [14]): $f: X \times E \rightarrow X$, (1)	yes	i t s c	The second primitive is the stimulus or input $e \in E$, to which the system's vulnerability was assessed. This input was given by the scenarios of climate, land use and nitrogen deposition, which represent the pos- sible evolutions of the environment. The scenarios were based on the IPCC SRES

		(lonesco et al. 2009, 4)			storylines (for details, see [22]). (Ionesco et al. 2009, 12) [] The second primitive, the stimulus or input to which the entity's vulnerability was assessed, was given in the form of climate, land-use and socio-economic scenarios. Similar to ATEAM, these were developed on the basis of the IPCC SRES storylines. (Ionesco et al. 2009, 13)
unavoidable	Yes	Definition (Unavoidable hazard) An	Not		
hazards		input e is an	operationalized		
		unavoidable hazard for a system f in			
		state x if $\forall u \in U : f(x, e, u) \prec f(x, e*, u*)$.			
		(Ionesco et al. 2009, 8)			
Vulnerability	Yes	Definition (Vulnerability with a	No	Entity; stimulus;	
		reference input) A system $f : X \times E \rightarrow X$ in		preference	
		state x is vulnerable to e with respect to		criteria	
		the strict partial order \prec and the			
		reference input e_* if			
		f (x, e) ≺ f (x, e*) []			
		\prec and the reference scenario es* \in En if			
		$x_{S} \prec x_{S}*$			
		Definition (Vulnerability with a			
		reference scenario)A system f : $X \times E \rightarrow$			
		X in state x is vulnerable to input			
		scenario es \in En with respect to the			
		strict partial order			
		(8)			
		where xs and xs* are the trajectories induced by the input scenario and			
		reference scenario, respectively.			
		(lonesco et al. 2009, 6)			

<u>Construct</u>	Defined?	Definition or further info	Directly Operationalized?	Indirectly operationalized	Operational text
Adaptive capacity	Yes	Asper theIPCC's definition and framework, vulnerability is understood as a function of three components—exposure, sensitivity and adaptive capacity. Vulnerability is defined as "the degree to which a system is susceptible to or unable to cope with, adverse effects of climate change, including cli- mate variability and extremes" (IPCC 2001). (Jamir et al. 2013, 154)	Yes	<u>through:</u>	Household questionnaire surveys and participatory rural appraisal (PRA) were conducted in all the five villages in order to quantify each of these indicators. A total of 150 households (30 households in each village) were randomly selected across the villages for the household questionnaire survey. [] (Jamir et al. 2013, 156) Table 2 continued (Jamir et al. 2013, 158)
Agricultural	Yes	On the lines of Patnaik and Narayanan (2009), (Jamir et al. 2013, 156)	Yes		Table 3 Indicators of sources of vulnerability Indicators Source of vulnerability (Jamir et al. 2013, 159)
Biophysical	Yes	On the lines of Patnaik and Narayanan (2009), (Jamir et al. 2013, 156)	Yes		Table 3 Indicators of sources of vulnerability Indicators Source of vulnerability (Jamir et al. 2013, 159)
Climate-relted extrement events	No				
Demographic	Yes	On the lines of Patnaik and Narayanan (2009), (Jamir et al. 2013, 156)	Yes		Table 3 Indicators of sources of vulnerability Indicators Source of vulnerability (Jamir et al. 2013, 159)
Drought	Yes	The India Meteorological Department (IMD) defines drought as a rainfall deficit of 25 % or more from the district-level long-period average (LPA) (Jamir et al. 2013, 154)	Yes		Table 2 Description and rationale for indicators selected for the vulnerability assessment (Jamir et al. 2013, 157)
Exposure	Yes	Asper theIPCC's definition and framework, vulnerability	Yes		Household questionnaire surveys and participatory rural

		is understood as a function of three components—exposure, sensitivity and adaptive capacity. Vulnerability is defined as "the degree to which a system is susceptible to or unable to cope with, adverse effects of climate change, including cli- mate variability and extremes" (IPCC 2001). (Jamir et al. 2013, 154)			appraisal (PRA) were conducted in all the five villages in order to quantify each of these indicators. A total of 150 households (30 households in each village) were randomly selected across the villages for the household questionnaire survey. [] (Jamir et al. 2013, 156) Exposure Component indicators Extreme climate events Drought duration Extent of dryland (Jamir et al. 2013, 157)
Sensitivity	Yes	Asper theIPCC's definition and framework, vulnerability is understood as a function of three components—exposure, sensitivity and adaptive capacity. Vulnerability is defined as "the degree to which a system is susceptible to or unable to cope with, adverse effects of climate change, including cli- mate variability and extremes" (IPCC 2001). (Jamir et al. 2013, 154)	Yes		Household questionnaire surveys and participatory rural appraisal (PRA) were conducted in all the five villages in order to quantify each of these indicators. A total of 150 households (30 households in each village) were randomly selected across the villages for the household questionnaire survey. [] (Jamir et al. 2013, 156) Table 2 Description and rationale for indicators selected for the vulnerability assessment (Jamir et al. 2013, 157)
Socio-economic	Yes	On the lines of Patnaik and Narayanan (2009), (Jamir et al. 2013, 156)	Yes		Table 3 Indicators of sources of vulnerability Indicators Source of vulnerability (Jamir et al. 2013, 159)
Sources of vulnerability	Yes	On the lines of Patnaik and Narayanan (2009), (Jamir et al. 2013, 156)	No	Agricultural; biophysical; demographic;	

				socio-economic
Village level	No			
Vulnerability	Yes/no	Asper theIPCC's definition and framework, vulnerability is understood as a function of three components—exposure, sensitivity and adaptive capacity. Vulnerability is defined as "the degree to which a system is susceptible to or unable to cope with, adverse effects of climate change, including cli- mate variability and extremes" (IPCC 2001). (Jamir et al. 2013, 154)	No	Exposure; sensitivity; adaptive capacity

<u>Construct</u>	Defined?	Definition or further info	Directly	Indirectly	Operational text
			Operationalized?	operationalized	
				through:	
Coping capacity	Yes	Therefore we define vulnerability as	No	population	
		damage potential and coping capacity,		density; lack of	
		that is, damage potential + coping		decent housing;	
		capacity = regional vulnerability		lack of decend	
		(McCarthy et al. 2001; Mustafa 1998).		standard of	
		(Khan and Salman 2012, 164)		living; lack of	
				knowledge;	
				livestock	
				households and	
				farm households	
Damage	Yes	Therefore we define vulnerability as	No	population	
potential		damage potential and coping capacity,		density; lack of	
		that is, damage potential + coping		decent housing;	
		capacity = regional vulnerability		lack of decend	
		(McCarthy et al. 2001; Mustafa 1998).		standard of	
		(Khan and Salman 2012, 164)		living; lack of	
				knowledge;	
				livestock	

				households and farm households	
Lack of decent housing	Yes	 (3) Lack of decent housing: Lack of access to a proper housing facility, as measured by the weighted average of two variables, percentage of population having kacha (weighted 3/6) and semi-pacca (weighted 1/6) houses, is linked closely to vulnerability.iv (Khan and Salman 2012, 165) 	Yes		as measured by the weighted average of two variables, percentage of population having kacha (weighted 3/6) and semi-pacca (weighted 1/6) houses, (Khan and Salman 2012, 165)
Lack of decent standard of living	Yes	 (4) Lack of decent standard of living: Lack of access to overall socioeconomic provisions is measured by the average of two variables: the percentage of the population without access to piped water and the percentage of population with- out access to electricity (Khan and Salman 2012, 165) 	Yes		Lack of access to overall socioeconomic provisions is measured by the average of two variables: the percentage of the population without access to piped water and the percentage of population with- out access to electricity. (Khan and Salman 2012, 165)
Lack of knowledge	Yes	 (2) Lack of knowledge: Exclusion from the world of read- ing and communications, as measured by the adult illiteracy rate, is an additional factor affecting increased vulnerability. The ability to read and write and language skills improve access to information. Access to information is particularly important in times of disasters. (Khan and Salman 2012, 165) 	Yes		as measured by the adult illiteracy rate, (Khan and Salman 2012, 165)
Livestock households and farm households	Yes	Therefore, households depending on agriculture and livestock are the most direct victims of floods and are highly vulnerable. Arif, Iqbal, and Farooq (2010), using the 2000 Agriculture Census, classify rural households into	Yes		In making the human vulnerability index we used two variables: percent of households classified as farm households and percent of households classified as livestock households in each district.

		three broad categories: farm households that operate land as owner-cultivator or tenants; livestock households that have at least one cow or buffalo, 5 sheep and/or goats, and operate no farm area; and non- agriculture households that do not fall into farm and livestock household categories. In making the human vulnerability index we used two variables: percent of households classified as farm households and percent of households classified as livestock households in each district. (Khan and Salman 2012, 165)			(Khan and Salman 2012, 165)
Population density	Yes	 (1) Population density: Vulnerability to the effects of cli- mate change consists of vulnerability to death, displacement, trauma, and loss of assets and livelihoods. This is measured by population density. (Khan and Salman 2012, 165) 	Yes		This is measured by population density. (Khan and Salman 2012, 165)
Regional vulnerability	Yes	Therefore we define vulnerability as damage potential and coping capacity, that is, damage potential + coping capacity = regional vulnerability (McCarthy et al. 2001; Mustafa 1998). (Khan and Salman 2012, 164)	No	Damage potential; coping capacity	

Article: (Luers et al. 2003)							
<u>Construct</u>	Defined?	<u>Definition or further info</u>	Directly Operationalized?	<u>Indirectly</u> operationalized <u>through:</u>	<u>Operational text</u>		
Adaptive capacity	Yes	We define adaptive capacityas the extent to which a	Yes	[name of construct]	Management is the onlyone of these factors that farmers can		

		system can modify its circumstances to move to a less vulnerable condition (Fig. 1c). We quantifyadaptive capacity(A) as the difference in the vulnerabilityunder existing conditions and under the less vulnerable condition to which the system could potentially shift: A ¼ Võexisting conditionsÞ Võmodified conditionsÞ (Luers et al. 2003)(Luers et al. 2003, 259)		potentiallymanipulate to move to a less vulnerable condition. Therefore, in our analysis we estimate adaptive capacity from our time series of yields as the extent to which a farm unit has exceeded its average management percentile over the studyperiod. We assumed that the highest relative yield, as represented bythe yield percentile, could be achieved everyyear with the appropriate management. We estimate the adaptive capacityas the difference between the vulnerabilitycalculated as above and the vulner- abilitycalculated for a yield temperature function where we assume the expected yield is equal to the maximum yield percentiles observed over the four years. To create a unitless measure we normalize this difference bythe average value of the difference calculated for all pixels over the Valley: A ¼ ðVR mean 🛛VR maxÞpixel🖾 i ðVR mean 🔅VR maxÞvalleyav (Luers et al. 2003, 261)
Exposure	Yes	Different communities and ecosystems are exposed to varying magnitudes and frequencies of disturbing forces, often resulting in differential vulnerabilities (IPCC, 2001; Turner et al., 2003a, b). We capture these differences in exposure bycalculating the expected value of the ratio of sensitivityto the state relative to a threshold based on the frequencydistribution of the	Yes	For each of the four years, we compute the distribu- tion of yield within the entire Valley, and then rank yields by percentile for each year. We then use a linear least- squares regression of yield with average night-time temperature for January– April to define the average yield and sensitivity for each percentile. To define the vulnerabilitycorresponding to each percentile, we run a Monte Carlo simulation where temperature varies according to a normal distribution with

		stressors of concern: (Luers et al. 2003, 258)		mean equal to 9.61 [®] C and standard deviation equal to 0.99 [®] C, as determined from 20 years of historical climate records. (Luers et al. 2003, 261)
Sensitivity	Yes	In this example, the sensitivityis represented as the absolute value of the derivative of well- being with respect to the stressor, however, other measures of sensitivitycould be used, for example the coefficient of variations. (Luers et al. 2003, 258)	Yes	For each of the four years, we compute the distribu- tion of yield within the entire Valley, and then rank yields by percentile for each year. We then use a linear least- squares regression of yield with average night-time temperature for January– April to define the average yield and sensitivity for each percentile. To define the vulnerabilitycorresponding to each percentile, we run a Monte Carlo simulation where temperature varies according to a normal distribution with mean equal to 9.61 [®] C and standard deviation equal to 0.99 [®] C, as determined from 20 years of historical climate records. (Luers et al. 2003, 261)
State of system relative to threshold of damage	Yes	identifying a threshold of human well- being at which the system is said to be "damaged." (Luers et al. 2003, 257)	Yes	Our unit (or system) of analysis is the "farm unit"— that is an agricultural field and the farmer or farmers responsible for the field. For practical purposes, we define our agricultural field as a 30m ^[3] 30m pixel as described below. (Luers et al. 2003, 260)
Threshold of damage	Yes	W0 represents a threshold value of well-being below which the system is said to be damaged (Luers et al. 2003, 258)	Yes	a threshold value of 4 t/ha, which is the approximate minimum yield required for farmer's to "break-even" (i.e. zero net profit) based on the average management practices (Matson et al. 1998). (Luers et al. 2003, 261)

Vulnerability as suceptability	Yes	we derive a generic vulnerabilitymetric bytranslating a general definition of vulnerability, the susceptibilityto damage, into a mathematical expres- sion. To do this we first define a threshold of damage and then measure susceptibility in terms of the system's sensitivityto and exposure to stressors.We then propose a framework for estimating a system's ability to modify its vulnerable conditions byadapting and responding to changing circumstances.	No	State of system relative to threshold; sensitivity; exposure; adaptive capacity	
		circumstances. (Luers et al. 2003, 257)			
Well-being	Yes	human–environment system where some mea- sure of human well-being (W) (Luers et al. 2003, 257)	Yes		. Of the manyoutcomes of concern to the Valleyfarmer, we focus on wheat yield as our measure of well-being (Luers et al. 2003, 260)

Article: (Marshall	2010)				
<u>Construct</u>	Defined?	Definition or further info	Directly	Indirectly	Operational text
			Operationalized?	operationalized	
				<u>through:</u>	
ability to plan, learn, reorganise	Yes	A description of each dimension can be found in Marshall and Marshall (2007). (Marshall 2010, 38)	Yes		3.3. Planning, learning and reorganising for climate variability On a scale of 1–4, the mean response of graziers to questions about planning was 2.93 (s.e. = 0.03). Graziers were confident that they had the skills to plan and prepare for drought. Only a few graziers (21.2%), said that they "just hope for the best…if there is a drought" and only 28.8% believed that the, "future will look after itself." Most graziers (83.5%) said that, "at the onset of drought [they]

				plan a way to survive it". All the same, some 52% said that (Marshall 2010, 39)
Adpative capacity	Yes	It refers to the ability of individuals or communities to adapt to adversity and stressful life-events by 'reorganising' through networks or institutions that learn, store knowledge and experi- ence and are creative, flexible and novel in their approach to problem solving (Vayda and McCay, 1975; McCay, 1981; Sonn and Fisher, 1998). (Marshall 2010, 37)	Yes	Survey questions were developed so as to quantify a grazier's capacity to adapt to climate variability, their level of dependency on the resource and their likely uptake of seasonal climate forecasts (Marshall, 2008). Some questions within the survey, such as 'in what year were you born?', required simple answers. Some questions such as, 'are you employed as a land manager on someone else's land?' required a 'yes' or 'no' answer. Answers to most questions, however, were expressed as a statement and reflected an attitude, opinion or stance. (Marshall 2010, 38)
interest n change	Yes	A description of each dimension can be found in Marshall and Marshall (2007). (Marshall 2010, 38)	Yes	3.5. Interest in adapting to climate variability The mean response to questions about the level of interest in change was 2.89 (s.e. = .06) on a scale of 1– 4. This result reflects that 83.5% were, "interested in learning how [they] could better prepare for drought." Some graziers (60.4%), "attend workshops to get new ideas to better manage drought" and 71.5%, "talk about strategies to survive drought with others". (Marshall 2010, 39)
perception of risk	Yes	A description of each dimension can be found in Marshall and Marshall (2007). (Marshall 2010, 38)	Yes	3.2. Perception of risk associated with climate variability On a scale of 1–4, where any value greater than 2 is considered to be a positive response, the mean response of graziers to survey questions about risk was 2.9 (standard error = 0.03). Graziers in the Burdekin region positively perceived the risks associated with

				drought, but not overly. For example, 90.1% of graziers believed that they were more "likely to survive drought compared to other cattle producers". Most graziers were more positive towards approaching drought periods than they had been in their past since 82.5% were, " learning to survive drought periods more easily as [they] got older". Some 90.6% felt that they were prepared to, "take advantage of a particularly good season", suggesting that they felt positive about the future. More than half (56.9%) of the grazier population also disagreed with the sentiment that, "I am too young to retire and too old to find work elsewhere", suggesting that they felt positive as to their long-term business outcomes on the rangelands. Most graziers (81.4%) were not worried about the financial impacts of drought, since they had, "planned for [their] financial security in the event of a
				drought". (Marshall 2010, 39)
proximity to coping threshold	Yes	A description of each dimension can be found in Marshall and Marshall (2007). (Marshall 2010, 38)	Yes	3.4. Ability to cope with climate variabilityOverall, themean response to questionsabout copingwas 2.98(s.e. = 0.03) on a scale of 1–4. Over 55% ofgraziers thought that, "the uncertaintysurrounding drought is worse than thedrought event itself", where 75.5% said thattheir familywas, "used to bad times and[they know they] will survive futuredrought." Some 82.9% believed that their,"good years help [them] to survive the badyears". Whilst 82.9% suggested that their,"stress levels greatly increase in [their]family during drought periods", only 23.4%

				of graziers believed that, "my partner and I have different opinions about how to manage drought", and only 29.5% suggested that their, "current level of debt means that drought will be especially difficult to recover from." Many graziers (58.8%) disagreed that their, "financial situation is a constant source of worry." Instead, most graziers (90.9%) saw, "climate uncertainty as a normal part of [their] everyday life", where 79.1% say that, "regardless of what happenshave made sure that [they] are financially secure." Only 11.2% of graziers suggested that they, "rely on drought assistance to get [them] through drought years." All the same, 50.8% of graziers said that, "it was important for [them] to know how other graziers are coping in their business." Interestingly, if droughtdid force people off the land, only 54.2% of people said that they were, "interested in learning new skills outside of the industry". (Marshall 2010, 39)
Resilience	No			
resource dependency	Yes	Resource-dependent communities such as cattle-grazing commu- nities are more likely to be vulnerable to climate change since climate change is likely to significantly affect the grazing resource and the people dependent on it. However, resource dependency is a complex relationship since it has social, economic and environmental components (Jones, 2002). (Marshall 2010, 37)	Yes	Survey questions were developed so as to quantify a grazier's capacity to adapt to climate variability, their level of dependency on the resource and their likely uptake of seasonal climate forecasts (Marshall, 2008). Some questions within the survey, such as 'in what year were you born?', required simple answers. Some questions such as, 'are you employed as a land manager on someone else's land?' required a 'yes' or 'no' answer. Answers to most questions, however, were expressed as a statement and reflected an

				attitude, opinion or stance. (Marshall 2010, 38)
use of forecasts	Yes	Seasonal climate forecasts are an example of a supportive technology that can, with variable accuracy, provide probabilistic information about future climate for a period of three to twelve months (Ash et al., 2007; Jones et al., 2000; Tompkins and Adger, 2005). Climate technology may be able to assist graziers to minimise losses in drought years and take advantage of favourable seasons (Hayman et al., 2007; Salinger et al., 2005; Hansen, 2002; Eto, 2003; Moss, 2007). (Marshall 2010, 37)	Yes	Survey questions were developed so as to quantify a grazier's capacity to adapt to climate variability, their level of dependency on the resource and their likely uptake of seasonal climate forecasts (Marshall, 2008). Some questions within the survey, such as 'in what year were you born?', required simple answers. Some questions such as, 'are you employed as a land manager on someone else's land?' required a 'yes' or 'no' answer. Answers to most questions, however, were expressed as a statement and reflected an attitude, opinion or stance. (Marshall 2010, 38)

Article: (Mengistu	Article: (Mengistu 2011)							
Construct	Defined?	Definition or further info	Directly Operationalized?	Indirectly operationalized through:	Operational text			
Adaptation strategies	no		Yes/no/ not operationalized	[name of construct]				
Climate change	no							
Climate forecast methods	no							
Coping strategies	no							
Drought early warning systems	no							
Knowledge of farmers	no							
Perception of Adiha farmers	Yes	Adaptation of people to different hazards vary from household to households and region to region based on existing support system	Yes		Respondents were systematically sampled from Adiha tabia populations across all of the kueshets. One hundred forty four (144) respondents			

	to increase the resilience of		were sampled from popula- tion of the tabia.
	affected individuals. The		Various factors including gender (male/
	assessment was aimed to		female headed farm households), age, access
	generate primary information		to irriga- tion water and land holding size
	from the farming communities of		were considered during sampling.
	Adiha related to cli- mate		2.2.1. Focus Group Discussion (FGD) Focus
	change. This report examined the		Group Discussion (FGD) was employed to
	perception of Adiha farmers on		generate information on the perception of
	the trend of climate change and		the farmers on climate change, its related
	re-lated anomalities, existing		hazards, vulnerable groups of the community
	coping strategies in place.		and existing coping strategies. Six FGDs, each
	(Mengistu 2011, 139)		consisting 24 participants, 12 male and 12
			women, drawn from different kueshets, were
			held for climate re- lated hazard identification
			and characterization, identifi- cation and
			prioritization of coping mechanisms, identifi-
			cation and ranking of vulnerable groups and
			climate and weather forecasting. Tools such
			as hazard identification and characterization,
			hazard behavior story telling (time-line),
			hazard ranking matrix, vulnerability group
			ranking and experiential stories telling on
			indigenous technolo- gies and knowledge
			were used to acquire information on farmers'
			perception on climate change trends, existing
			hazards and their severity and vulnerable
			groups of the community. The different
			coping strategies used by the community
			were also identified and analyzed for their
			effectiveness. Effectiveness was rated as very
			satisfac- tory, satisfactory and not satisfactory
			and the rating number converted to percent
			to assess satisfaction level.
			Data Management and Analysis
			(Mengistu 2011, 139)

<u>Construct</u>	Defined?	Definition or further info	Directly Operationalized?	Indirectly operationalized	Operational text
				<u>through:</u>	
Access to food	No		not	[name of construct]	
			operationalized		
Access to	No		not		
sufficient food			operationalized		
Direct drivers	No		not		
			operationalized		
Food insecurity	Yes	Food insecurityin the	not		
		communities described by the	operationalized		
		case studies maybe			
		conceptualized as one element in			
		an entrenched and escalating			
		cycle of vulnerability (Fig. 3).			
		(Misselhorn 2005, 38)			
Food production	No		not		
			operationalized		
Household and	Yes	In general terms, vulner-	not		
community		abilityand social resilience have	operationalized		
vulnerability		been similarlydefined as the			
		abilityof a system or			
		communityto resist or absorb			
		adverse conditions.			
		[]			
		Vulnerable commu- nities, where			
		people are unable to buffer			
		themselves from hazards for a			
		number of reasons, have a low			
		ability to cope with short-term			
		shocks (such as drought) and to			
		mitigate chronic stressors, which			
		in turn means that the negative			
		impacts on livelihoods resulting			
		from coping and survival			
		strategies are veryhigh.			
		(Misselhorn 2005, 38)			
Indirect drivers	No		not		

			operationalized	
Livelihood level	No		not	
issues			operationalized	
Livelihood strategies	yes	A livelihood maybe described as the capability, assets and activites required for a means of living. People everywhere pursue a range of livelihood strategies in attempting to increase their income and asset base ('accumulation strategies'), spread or reduce risk (in- crease	not operationalized	
		securitythrough 'adaptive strategies'), mitigate the impact of shocks ('coping strategies'), and at the extreme, ensure survival through 'survival strategies' (Devereux, 1999; Scoones, 2000). (Misselhorn 2005, 38)		

Article: (Mubaya	et al. 2012)				
<u>Construct</u>	Defined?	Definition or further info	<u>Directly</u>	<u>Indirectly</u>	Operational text
			Operationalized?	operationalized	
				<u>through:</u>	
Climate change	Yes	In this paper, the distinction between 'climate variability' and 'climate change' relates to differences in time-scale. On the one hand, 'climate variability' is conceptualised as variations in the climate system over short time scales such as months, years or decades and on the other hand 'climate change' is conceptualised as longer term	Yes		FGDs were used to first of all establish the general perceptions regarding climate change and variability and their causes and various stressors that confront farmers' livelihoods (see Appendix 2). [] The questionnaire survey was used to collect household data and complement data generated through the qualitative methods. This

		trends in mean climate variables of periods of decades or longer. This is the suggested distinction in definitions of the concepts in question by the IPCC (2001). (Mubaya et al. 2012, 10)		survey collected data on changes in crops grown over a period of five years and reasons for these changes, indicators for good and bad crop production seasons and years considered to be good or bad over a ten year period. Questions in the survey also related to changes in weather patterns over a ten year period in relation to agriculture and what might have caused these changes. General household characteristics were also captured in this survey (see Appendix 1). (Mubaya et al. 2012, 11)
Climate change and variability	Yes	In this paper, the distinction between 'climate variability' and 'climate change' relates to differences in time-scale. On the one hand, 'climate variability' is conceptualised as variations in the climate system over short time scales such as months, years or decades and on the other hand 'climate change' is conceptualised as longer term trends in mean climate variables of periods of decades or longer. This is the suggested distinction in definitions of the concepts in question by the IPCC (2001). (Mubaya et al. 2012, 10)	Yes	FGDs were used to first of all establish the general perceptions regarding climate change and variability and their causes and various stressors that confront farmers' livelihoods (see Appendix 2). [] The questionnaire survey was used to collect household data and complement data generated through the qualitative methods. This survey collected data on changes in crops grown over a period of five years and reasons for these changes, indicators for good and bad crop production seasons and years considered to be good or bad over a ten year period. Questions in the survey also related to changes in weather patterns over a ten year period in relation to agriculture and what might have caused these changes. General household characteristics were also

				captured in this survey (see Appendix 1). (Mubaya et al. 2012, 11)
Climate variability	Yes	In this paper, the distinction between 'climate variability' and 'climate change' relates to differences in time-scale. On the one hand, 'climate variability' is conceptualised as variations in the climate system over short time scales such as months, years or decades and on the other hand 'climate change' is conceptualised as longer term trends in mean climate variables of periods of decades or longer. This is the suggested distinction in definitions of the concepts in question by the IPCC (2001). (Mubaya et al. 2012, 10)	Yes	FGDs were used to first of all establish the general perceptions regarding climate change and variability and their causes and various stressors that confront farmers' livelihoods (see Appendix 2). [] The questionnaire survey was used to collect household data and complement data generated through the qualitative methods. This survey collected data on changes in crops grown over a period of five years and reasons for these changes, indicators for good and bad crop production seasons and years considered to be good or bad over a ten year period. Questions in the survey also related to changes in weather patterns over a ten year period in relation to agriculture and what might have caused these changes. General household characteristics were also captured in this survey (see Appendix 1). (Mubaya et al. 2012, 11)
Farmer perceptions	Yes	there is an alternative approach which underscores how individuals perceive their environment and make decisions, with mal-adaptations attributed to problems in perception, cognition or the lack of available information (Diggs, 1991; Saarinen, 1966; Taylor et	Yes	To understand farmers' perceptions of climate and non-climate risks, this study employed both qualitative and quantitative methodologies. The qualitative methods of data collection used include Participatory Rural Appraisal (PRA) techniques such as historical trend analysis and matrix scoring and ranking

		al., 1988). The main point is that from whatever level these adapta- tion measures are taken, the adaptation and coping measures depend on households' perceptions of extreme events and the problems associated with them (Davies, 1993). (Mubaya et al. 2012, 10)		and Focus Group Discussions (FGDs). The quantitative method used is the household questionnaire survey. The sampling procedure and two approaches are presented in the following sections. (Mubaya et al. 2012, 10)
Non-climatic stress	Yes	It is important to note though, that climate change amplifies already existing risks for farmers. This is the case as there are non- climatic risk factors such as economic instability, trade liberalisa- tion, conflicts and poor governance that may also be faced by farmers (Nyong and Niang-Diop, 2006). Other factors are impacts of diseases such as malaria and HIV and AIDS and lack of and limited access to climate and agricultural information (Gandure, 2005; Gandure and Marongwe, 2006). Africa is also characterised by institutional and legal frameworks that are, in some cases, insuffi- cient to deal with environmental degradation and disaster risks (Beg et al., 2002; Sokona and Denton, 2001). (Mubaya et al. 2012, 10)	Yes	FGDs were used to first of all establish the general perceptions regarding climate change and variability and their causes and various stressors that confront farmers' livelihoods (see Appendix 2). [] The questionnaire survey was used to collect household data and complement data generated through the qualitative methods. This survey collected data on changes in crops grown over a period of five years and reasons for these changes, indicators for good and bad crop production seasons and years considered to be good or bad over a ten year period. Questions in the survey also related to changes in weather patterns over a ten year period in relation to agriculture and what might have caused these changes. General household characteristics were also captured in this survey (see Appendix 1). (Mubaya et al. 2012, 11)
Threat to livelihoods	No			

<u>Construct</u>	Defined?	Definition or further info	Directly	Indirectly	Operational text
		<u> </u>	Operationalized?	operationalized	<u></u>
			<u></u>	through:	
Cereal production	Yes	Smallholder farmers in Zimbabwe commonly produce cereals such as maize, millet and sorghum; with maize being the staple food and most commonly grown cereal. The energy content of the three cereals is almost the same, with maize, millet and sorghum producing 358, 329 and 336 kilocalories per 100g of grain respectively (Leder, 2010). In this study maize, sorghum and millet produced by the household is added so as to determine how much per capita cereal is produced by the household. [] In addition the Southern Africa Regional Poverty Network's (2003) report on the regional overview of the southern African food security crisis suggests that an average family of 6 people requires about 800 -1000kg annually of cereal to be food secure, which also suggests a per capita cereal requirement of approximately 165kg. (Mutsvangwa 2011, 22)	Yes		In addition the Southern Africa Regiona Poverty Network's (2003) report on the regional overview of the southern African food security crisis suggests tha an average family of 6 people requires about 800 -1000kg annually of cereal to be food secure, which also suggests a per capita cereal requirement of approximately 165kg. (Mutsvangwa 2011, 22) [] Table 4: Data from the household questionnaires: yields obtained; (Mutsvangwa 2011, 40)
Chinate change	NU				

insecurity food insecurity	No	vulnerability status of smallholder farmers in different locations will be influenced by the household's ability to produce enough to ensure the household's food security. (Mutsvangwa 2011) (Mutsvangwa 2011, 21)	vulnerability threshold	
small holder	No			
farmers				
Vulnerability	Yes	 vulnerability as a starting point which focuses on the susceptibility of the household2 (Füssel., 2007). This study takes on the starting point interpretation, which takes the root problem as social vulnerability and examines the current vulnerability of the households as a measure of vulnerability to climate change. Households that are currently vulnerable to food insecurity will find it difficult to cope with adverse impacts of changes in climatic conditions. Thus measuring the likelihood of being food insecure provides a way to examine vulnerability to climate change. (Mutsvangwa 2011, 2) [] Vulnerability refers to the manner and degree to which a system is susceptible to conditions that negatively affect the well-being of the system. In 	Climate change; small holder farmers; food insecurity	

		the climate change field, the IPCC			
		Third Assessment Report defines			
		vulnerability as "the degree to			
		which a system is susceptible to,			
		or unable to cope with, adverse			
		effects of climate change,			
		including climate variability and			
		extremes" (McCarthy et al.,			
		2001).			
		(Mutsvangwa 2011, 15)			
		[]			
		The differences between these			
		two interpretations of			
		vulnerability are summarized in			
		Table 1.			
		Vulnerability according to the			
		end point interpretation			
		represent the expected net			
		impacts of a given level of global			
		climate change, taking into			
		account feasible adaptations.			
		Vulnerability according to the			
		starting point interpretation			
		focuses on reducing internal			
		socioeconomic vulnerability to			
		any climatic hazard. This study			
		takes on the starting point			
		interpretation.			
		(Mutsvangwa 2011, 17)			
vulnerability	Yes	The choice of the vulnerability	Yes	Yes	Thus a household is considered
threshold		threshold involves generating a			vulnerable food insecurity if the
		sample that is classified into two			probability is equal or greater than 0.5
		groups, that is those that are			and less likely to be vulnerable to food
		vulnerable and those that are not			insecurity if the probability is less than
		vulnerable to food insecurity. It			0.5.
		entails establishing a			(Mutsvangwa 2011, 23)
		vulnerability threshold, such that			
		a household is said to be			

		vulnerable if its vulnerability probability is greater or equal to v, i.e. vh ≥ v. (Mutsvangwa 2011, 22)			
welfare indicator	Yes	This study uses the household's cereal production levels as a measure of welfare. Farmers in both Gweru and Lupane mainly depend on what they produce for household food security, thus what the households produce is equated to consumptions levels for the household, in this study. (Mutsvangwa 2011) (Mutsvangwa 2011, 21)	No	Cereal production	

Article: (Nkondze,	Article: (Nkondze, Masuku, and Manyatsi 2013)							
<u>Construct</u>	Defined?	Definition or further info	Directly Operationalized?	Indirectly operationalized	Operational text			
			<u>- </u>	through:				
Household	No		Yes/no/ not	[name of				
vulnerability to			operationalized	construct]				
climate change								
Factors affecting	No							
vulnerability								

Article: (Notenbaert et al. 2013)							
<u>Construct</u>	Defined?	Definition or further info	Directly Operationalized?	Indirectly operationalized through:	Operational text		
Adaptive capacity	Yes/no	the risk response or the options that people have for managing these risks (Turner et al. 2003). (Notenbaert et al. 2013, 460)	No	Response and management options			
Exposure		risks (or a chain of risky events) that	Yes		Differences in vulnerability, described as		

Institutional environment	people confront in pursuit of their livelihoods, (Turner et al. 2003). (Notenbaert et al. 2013, 460) (Turner et al. 2003). (Notenbaert et al. 2013, 460)	Yes	outcomes of this exposure, are therefore attributed to differences in sensitivity and adaptive capacity only. (Notenbaert et al. 2013, 460)As with the exposure, we therefore assume these are equal for all households in the same village.
Livelihood assets	(Turner et al. 2003). (Notenbaert et al. 2013, 460)	Yes	(Notenbaert et al. 2013, 462)The questionnaire was divided into the following five sections: (1) household composition, livelihood strategies and livestock assets; (2) household livestock
Livelihood strategies	(Turner et al. 2003). (Notenbaert et al. 2013, 460)	Yes	2013, 461) The questionnaire was divided into the following five sections: (1) household composition, livelihood strategies and livestock assets; (2) household livestock ownership, herd dynamics and species; (3) livestock feeding tech- niques,

			management, products and markets, (4) welfare outcomes (income, food consumption and health) and (5) focused on the main concerns/challenges facing households and their coping strategies. In this last section, households were asked to list and rank their concerns and describe the coping strategies employed to counter these concerns. Furthermore, the households were asked to compare with other households (in the same village) the extent to which they have been coping. For each of the concerns they were facing, they were asked whether they had been coping either better than, worse than or similar to other households in their village. (Notenbaert et al. 2013) (Notenbaert et al. 2013, 461)
Livelihoods	(Turner et al. 2003). (Notenbaert et al. 2013, 460)	Yes	The questionnaire was divided into the following five sections: (1) household composition, livelihood strategies and livestock assets; (2) household livestock ownership, herd dynamics and species; (3) livestock feeding tech- niques, management, products and markets, (4) welfare outcomes (income, food consumption and health) and (5) focused on the main concerns/challenges facing households and their coping strategies. In this last section, households were asked to list and rank their concerns and describe the coping strategies employed to counter these concerns. Furthermore, the households were asked to compare with other households (in the same village) the extent to which they have been coping. For each of the concerns they were facing, they were asked whether they had been coping

				either better than, worse than or similar to other households in their village. (Notenbaert et al. 2013) (Notenbaert et al. 2013, 461)
Response and management options	(Turner et al. 2003). (Notenbaert et al. 2013, 460)	No	Livelihoods; livelihood assets; livelihood strategies; institutional environment	
Risks	(Turner et al. 2003). (Notenbaert et al. 2013, 460)	Yes		Differences in vulnerability, described as outcomes of this exposure, are therefore attributed to differences in sensitivity and adaptive capacity only. (Notenbaert et al. 2013, 460)
sensitivity	the sensitivity of the livelihood to these risks, (Turner et al. 2003). (Notenbaert et al. 2013, 460)	No	Risks; livelihoods	
Vulnerability	For the purpose of this paper, we work with the definition proposed by the Working Group II of the IPCC in the third assess- ment report. We will refer to (1) exposure to climate change impacts, (2) sensitivity to those impacts and (3) the capacity to cope with those impacts as the components of vulnerability. Vulnerability is thus comprised of risks (or a chain of risky events) that people confront in pursuit of their livelihoods, the sensitivity of the livelihood to these risks, the risk response or the options that people have for managing these risks and finally the outcomes that describe the loss in well-being (Turner et al. 2003). (Notenbaert et al. 2013, 460)	No	Exposure; sensitivity; adaptive capacity; vulnerability outcomes	
Vulnerability	the outcomes that describe the loss in	Yes		The questionnaire was divided into the

outcomes	well-being (Turner et al. 2003). (Notenbaert et al. 2013, 460)	following five sections: (1) household composition, livelihood strategies and livestock assets; (2) household livestock ownership, herd dynamics and species; (3) livestock feeding tech- niques, management, products and markets, (4) welfare outcomes (income, food consumption and health) and (5) focused on the main concerns/challenges facing households and their coping strategies. In this last section, households were asked to list and rank their concerns and describe the coping strategies employed to counter
		these concerns. Furthermore, the households were asked to compare with other households (in the same village) the extent to which they have been coping. For
		each of the concerns they were facing, they were asked whether they had been coping either better than, worse than or similar to other households in their village.
		(Notenbaert et al. 2013) (Notenbaert et al. 2013, 461)

Article: (Piya, Ma	Article: (Piya, Maharjan, and Joshi 2012)							
<u>Construct</u>	Defined?	Definition or further info	<u>Directly</u>	Indirectly	Operational text			
			Operationalized?	operationalized				
				<u>through:</u>				
Adaptive	Yes/no	Adaptive capacity is the ability of a	No	Livelihood				
capacity		system to adjust to climate change		assets				
		including climate variability and						
		extremes, to moderate the potential						
		damage from it, to take advantage of its						
		opportunities, or to cope with its						
		consequences. Selection of indicators						
		for adaptive capacity is based on the						
		DFID sustainable livelihoods framework,						

Exposure	Yes	 whereby adaptive capacity is taken to be a function of asset possession by the households (Jakobsen, 2011; Nelson, et al., 2010b). (Piya, Maharjan, and Joshi 2012, 12) Exposure is the nature and degree to which a system is exposed to significant climatic variations. (Piya, Maharjan, and Joshi 2012, 11) 	Yes		or this study, historical changes in climate variables and occurrence of extreme climatic events are taken as indicators of exposure (Table 1). (Piya, Maharjan, and Joshi 2012, 12)
Financial capital	Yes	Ellis (2000) and DFID (1999) (Piya, Maharjan, and Joshi 2012, 7)(Piya, Maharjan, and Joshi 2012)	Yes		Table 3. Indicators for adaptive capacity (Piya, Maharjan, and Joshi 2012, 14)(Piya, Maharjan, and Joshi 2012)
Human capital	Yes	Ellis (2000) and DFID (1999) (Piya, Maharjan, and Joshi 2012, 7)(Piya, Maharjan, and Joshi 2012)	Yes		Table 3. Indicators for adaptive capacity (Piya, Maharjan, and Joshi 2012, 14)(Piya, Maharjan, and Joshi 2012)
Livelihood assets	Yes	The sustainable livelihoods approaches which views livelihood outcomes as a function of the ownership or access to livelihood assets is principally based on Nobel Laureate Amartya Sen's entitlements approach, where by households with sufficient range of entitlements, capabilities or assets have more choices of adopting strategies suitable to cope during the periods of adversities or minimize the associated risks (Jakobsen, 2011; Ludi & Slate, 2008). The lack of or limited access to livelihood assets increases the defenselessness or incapacity to avoid risks as well as increases the shocks and stresses to which an individual or household is exposed to (Shahbaz, 2008). On the other hand, households with diversified asset portfolio are more capable to reduce risks and to cope with or adapt to increased level of risks.	No	Physical capital; human capital; natural capital; financial capital; social capital	The first phase of the household survey was focused on collection of data related to demographics, livelihood assets (landholdings, livestock holdings, savings, loans, education, trainings, membership to CBOs, infrastructure, and physical assets), livelihood activities, income sources, and expenditures. (Piya, Maharjan, and Joshi 2012, 10)

		Such households will have more options			
		to substitute among alternative			
		livelihood activities during the times of			
		stress, thereby having more adaptive			
		capacity. For instance, households with			
		access to irrigation (physical assets) will			
		face less risks of crop damage during			
		droughts compared to those			
		households depending entirely on			
		rainfed agriculture. Similarly,			
		households with higher savings			
		(financial assets) or memberships in			
		saving and credit institutions (social			
		assets) have greater capability to			
		minimize livelihood risks posed by crop			
		failure due to bad weather. Finally,			
		households having some non-farm			
		sources in addition to farming will			
		improve the adaptive capacity of the			
		households against the climatic stresses			
		through distribution of risks across			
		various livelihoods sources.			
		(Piya, Maharjan, and Joshi 2012,			
		7)(Piya, Maharjan, and Joshi 2012)			
Local level	Yes	Following the definition of vulnerability	No	Exposure;	
vulnerability		given by IPCC (2001), vulnerability in		sensitivity;	
,		this		adaptive	
		study is taken to be a function of		capacity	
		exposure, sensitivity, and adaptive			
		capacity.			
		(Piya, Maharjan, and Joshi 2012, 11)			
Natural capital	Yes	Ellis (2000) and DFID (1999)	Yes		Table 3. Indicators for adaptive capacity
	100	(Piya, Maharjan, and Joshi 2012,			(Piya, Maharjan, and Joshi 2012, 14)(Piya,
		7)(Piya, Maharjan, and Joshi 2012)			Maharjan, and Joshi 2012)
Physical capital	Yes	Ellis (2000) and DFID (1999)	Yes	1	Table 3. Indicators for adaptive capacity
. Hysical capital	105	(Piya, Maharjan, and Joshi 2012,			(Piya, Maharjan, and Joshi 2012, 14)(Piya,
		7)(Piya, Maharjan, and Joshi 2012)			Maharjan, and Joshi 2012)
Sensitivity	Yes	is the degree to which a system is	Yes		Livelihood impacts of climate related
Jensitivity	163	is the degree to which a system is	163	1	

		affected, either adversely or beneficially by climate-related stimuli. (Piya, Maharjan, and Joshi 2012, 10)		disasters were taken as the sensitivity indicator following Daze, Ambrose, & Ehrhart (2009) and Marshall et al. (2009). Deaths of family members and loss of properties (viz. land, livestock, and crop) due to climate related disasters over the last ten years represent the sensitivity for the purpose of this study. (Piya, Maharjan, and Joshi 2012, 12, 13)
Social capital	Yes	Ellis (2000) and DFID (1999) (Piya, Maharjan, and Joshi 2012, 7)(Piya, Maharjan, and Joshi 2012)	yes	Table 3. Indicators for adaptive capacity (Piya, Maharjan, and Joshi 2012, 14)(Piya, Maharjan, and Joshi 2012)

Article: (Sallu, Tw	Article: (Sallu, Twyman, and Stringer 2010)							
<u>Construct</u>	Defined?	Definition or further info	Directly Operationalized?	Indirectly operationalized through:	Operational text			
dynamic natural resource base	Yes	(see Sallu [2007] for a more detailed outline of the methodology and data) (Sallu, Twyman, and Stringer 2010, 5)	Yes		Repeated vegetation and wild animal surveys were conducted before and after rains, and time-series sets of Landsat images and wild animal aerial count data records were collected from the Department of Surveys and Mapping and the Department of Wildlife and National Parks. Soil and climate data were collected from the Department of Surveys and Mapping and the Department of Meteorological Services, respectively (see Sallu [2007] for a more detailed outline of the methodology and data). (Sallu, Twyman, and Stringer 2010, 5)			
factors influencing resilience and vulnerability	Yes	Through comparative research we provide a rich contextual narrative and use it to explore those factors that in isolation and combination push livelihoods along particular	Yes		Methods used included oral histories and in-depth livelihood trajectory mapping exercises (n = 17), as well as household- level livelihood and resource use surveys (n = 98). These sought to identify the ways in			

		"trajectories" towards vulnerability or resilience. (Sallu, Twyman, and Stringer 2010, 2)			which households use their environment, how environmental changes (drought, land degradation, etc.) affect livelihood decisions, and how environmental factors interact with broader socioeconomic and political processes to determine resource use outcomes and impacts on livelihood systems. (Sallu, Twyman, and Stringer 2010, 4, 5)
livelihood trajectories	Yes	Bagchi et al. (1998) use the term "livelihood trajectories" to describe and explain the direction and pattern of livelihoods of individuals or groups of people (e.g., households). A livelihood trajectory approach allows the examination of an individual household's "strategic behavior that is embedded in a historical repertoire, in social differentiation" (de Haan and Zoomers 2005), and in perceptions of risk. Such an approach is sensitive to life histories (an individual's own "story" of their changing livelihoods). (Sallu, Twyman, and Stringer 2010, 2)	Yes		Methods used included oral histories and in-depth livelihood trajectory mapping exercises (n = 17), as well as household- level livelihood and resource use surveys (n = 98). These sought to identify the ways in which households use their environment, how environmental changes (drought, land degradation, etc.) affect livelihood decisions, and how environmental factors interact with broader socioeconomic and political processes to determine resource use outcomes and impacts on livelihood systems. (Sallu, Twyman, and Stringer 2010, 4, 5)
resilience and vulnerability of rural livelihoods	yes	Fraser et al.'s (2010) vulnerability framework (Sallu, Twyman, and Stringer 2010, 2)	No	Livelihood trajectories; factors influencing resilience and vulnerability	

Article: (Sarris and Karfakis 2010)						
<u>Construct</u>	Defined?	<u>Definition or further info</u>	Directly Operationalized?	Indirectly operationalized through:	Operational text	
cash crop growing	No			[name of construct]		

households				
covariate shocks	Yes	The proposed methodology complements the applications by Chaudhuri. et. al. (2002) and Christiaensen and Subbarao (2005), through the inclusion of covariate risks (Sarris and Karfakis 2010, 3)	Yes	Shocks enumerated in the household survey fall into four broad categories: (1) climatic and agricultural, which includes drought, heavy rainfall, including flooding, hailstorm and major harvest losses due to pests; (2) health, comprising death of a household member and illness not resulting in death; (3) economic, including unemployment and negative price shocks; and (4) asset shocks, which include theft, loss of livestock, loss of land or eviction, and fire. Table 2 summarizes the incidence of shocks among cash and non-cash producing households in the two regions. (Sarris and Karfakis 2010, 12)
crop-growing households	No			
household consumption	Yes	consumption falling below a poverty threshold (Christiaensen and Subbarao 2004, Chaudhuri, et. al. 2002) (Sarris and Karfakis 2010, 4)	Yes	Table 1 presents the basic characteristics of rural households in the two regions in Tanzania for which we have data, as derived from the two surveys. (Sarris and Karfakis 2010, 10)
household socio-economic characteristics	No			
idiosyncratic shocks	Yes	Chistiaensen and Subbarao (2005) included covariate as well as idiosyncratic shocks (Sarris and Karfakis 2010, 6)	Yes	Shocks enumerated in the household survey fall into four broad categories: (1) climatic and agricultural, which includes drought, heavy rainfall, including flooding, hailstorm and major harvest losses due to pests; (2) health, comprising death of a household member and illness not resulting in death; (3) economic, including unemployment and negative price shocks; and (4) asset shocks, which include theft, loss of livestock, loss of land or eviction, and fire. Table 2 summarizes the incidence

				produ	ocks among cash and non-cash ucing households in the two regions. s and Karfakis 2010, 12)
non-cash crop growing households	no				
Rural household vulnerability		Thus a household is said to be vulnerable to the outcome of a risk event, if it does not have sufficient resources to adequately contend with the risk event. In other words, the extent to which a household is vulnerable to a risk event, namely the extent to which the household can become and/or remain poor or food deprived, depends on the size of the risk event and how effective the household is in managing the risk event. (Sarris and Karfakis 2010, 1) [] considers vulnerability as the probability of consumption falling below a poverty threshold (Christiaensen and Subbarao 2004, Chaudhuri, et. al. 2002), (Sarris and Karfakis 2010, 4)	Not operationalized		

Article: (Sietz, Ch	Article: (Sietz, Choque, and Lüdeke 2012)						
<u>Construct</u>	Defined?	Definition or further info	Directly Operationalized?	Indirectly operationalized through:	Operational text		
access to food	Yes	Food security is often discussed in terms of four dimensions: food availability, access, stability of supply/ access and utilisation (FAO 2000).	not operationalized				

		(Sietz, Choque, and Lüdeke 2012, 490)		
adaptive capacity	Yes	the adaptive capacity of smallholders (the term as used in this study encompasses the coping capacity) describes the ability to adjust to weather extremes, manage damages or explore alternative livelihood opportunities. (Sietz, Choque, and Lüdeke 2012, 490)	Yes	The ALTAGRO (2006) data base contains detailed quantitative information for 527 smallholder households collected through household questionnaires. The data refer to the 2005/2006 agricultural campaign. Ten categories describe the smallholder households covering personal information about the family members (e.g. occupation, education level, age), production systems (e.g. crop and livestock assets, labour input, processing and commer- cialisation of produce), weather conditions, food reserves, (Sietz, Choque, and Lüdeke 2012, 494) [] The data given in Table 1 describe the attributes of 268 smallholder households located in our study region. (Sietz, Choque, and Lüdeke 2012, 495)
cluster pattern analysis	Yes	Without such a pre-selection, alternative approaches investigate the structure of the data space spanned by selected vulnerability indicators using cluster analysis. They deliver useful insights into recurrent indicator com- binations based on similarities among units of analysis, in cases where such a grouping exists. For example, clustering revealed typical livelihood strategies employed by small- holders in Mexico and Botswana (Eakin 2005; Sallu et al. 2010). (Sietz, Choque, and Lüdeke 2012, 492)	Yes	The cluster analysis was performed using a sequence of a common hierarchical and exchange algorithm, i.e., hclust and kmeans, using the statistics package R (MacQueen 1967; RDCT 2009). Based on stochastic initialisation, we calculated the reproducibility of partitions for a pre-given number of clusters to determine whether the algorithm detects stable or unstable (inappropriate) partitions. (Sietz, Choque, and Lüdeke 2012, 498)
Exposure	Yes	expo- sure, sensitivity and	Yes	The climate exposure is determined by

		coping/adaptive capacity (IPCC 2007). (Sietz, Choque, and Lüdeke 2012, 490)		precipitation and temperature conditions as main natural production factors. We refer to both the 2005/2006 and the preceding agri- cultural campaign. Weather conditions during these two campaigns influenced food production and available reserves in the campaign under investigation. Furthermore, we use a well- documented additional campaign to identify the conditions for drought and water stress. The necessary weather information is available in good quality for the 1996–2006 period for two stations located in Puno and Cabanillas (see Fig. 1). Table 2 shows the average pre- cipitation and temperature for both stations. ADDIN ZOTERO_ITEM {"citationID":"W8dCEV71","properties":{"fo rmattedCitation":"{\\rtf (Sietz, Choque, and L\\uc0\\u252{}deke 2012)}","plainCitation":""},"citationItems":[{"id":676,"uris":["http://zotero.org/users/1 986215/items/BS99PSWR"],"uri":["http://z otero.org/users/1986215/items/BS99PSWR "]}]} (Sietz, Choque, and Lüdeke 2012) {Sietz, Choque, and Lüdeke 2012, 496)
food availability	Yes	Food security is often discussed in terms of four dimensions: food availability, access, stability of supply/ access and utilisation (FAO 2000). (Sietz, Choque, and Lüdeke 2012, 490)	No operationalized	
food security	Yes	Food security is often discussed in terms of four dimensions: food availability, access, stability of supply/ access and utilisation (FAO 2000).	yes	For the outcome-oriented aspect of validation, we assume that an increased purchase of food and fodder indicates damage since it forces the household to mobilise resources which

(Sietz, Choque, and Lüdeke 2012, 490)	may have been earmarked for other pur-
(Sietz) Shoque, and Eddeke 2012, 490)	poses. We collected data on the purchase
	of food and fodder in 2005/2006 including
	monetary and in-kind exchange. The
	purchase was considered in relation to an
	average year to compare households in a
	standardised way. The average year
	indicates the necessary purchase which
	complements the household's production
	and reserves to maintain the average
	nutritional status. We assume that changes
	in 2005/2006 were primarily caused by the
	iden- tified weather extremes given that
	the productive resources and agricultural
	management are relatively stable over
	time. As smallholders do not maintain
	records of their pur-
	chase, the data collection drew on their
	memory recall. This approach provides
	good estimates in the absence of other
	reliable data sources, though some
	limitations need to be considered. Most
	importantly, this method does not account
	for memory biases. To reduce such biases,
	the survey referred to the purchase of a
	specific crop in a given year. Firstly,
	smallholders were asked to reflect on
	thecroptheyharvested last, starting with the
	previous campaign and successively moving
	backwards to the 2005/2006 campaign.
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	{"citationID":"TmahHttY","properties":{"for
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	2012)}","plainCitation":""},"citationItems":[
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	986215/items/BS99PSWR"],"uri":["http://z
	otero.org/users/1986215/items/BS99PSWR

					"]}]} (Sietz, Choque, and Lüdeke 2012) (Sietz, Choque, and Lüdeke 2012, 499)
household characterisitcs	No				
Sensitivity	Yes	We consider the effects of weather disturbance on the agricultural systems as sensitivity. (Sietz, Choque, and Lüdeke 2012, 490)	Yes		The ALTAGRO (2006) data base contains detailed quantitative information for 527 smallholder households collected through household questionnaires. The data refer to the 2005/2006 agricultural campaign. Ten categories describe the smallholder households covering personal information about the family members (e.g. occupation, education level, age), production systems (e.g. crop and livestock assets, labour input, processing and commer- cialisation of produce), weather conditions, food reserves, [] The data given in Table 1 describe the attributes of 268 smallholder households located in our study region. ADDIN ZOTERO_ITEM {"citationID":"OyC4m1MO","properties":{"f ormattedCitation":"{\\rtf (Sietz, Choque, and L\\uc0\\u252{}deke 2012)}","plainCitation":""},"citationItems":[{"id":676,"uris":["http://zotero.org/users/1 986215/items/BS99PSWR"],"uri":["http://z otero.org/users/1986215/items/BS99PSWR "]}]} (Sietz, Choque, and Lüdeke 2012) (Sietz, Choque, and Lüdeke 2012, 494)
Vulnerability	Yes	Climate vulnerability is considered as a function of expo- sure, sensitivity and coping/adaptive capacity (IPCC 2007).	No	Exposure; sensitivity; adaptive	

		(Sietz, Choque, and Lüdeke 2012, 490)	capacity; food security	
vulnerability creating mechanisms	No			
weather extremes	No			

Construct	Defined?	Definition or further info	Directly	Indirectly	Operational text
			Operationalized?	operationalized	
				through:	
adaptive capacity	Yes	According to Füssel and Klein, the risk- hazard framework (biophysical approach) corresponds most closely to sensitivity in the IPCC ter- minology while the adaptive capacity (broader social development) is largely consistent with the socioeco- nomic approach [18]. [] In the framework, capacity is generated from the implementation of adaptation and mitigation intervene- tions [18]. (Tesso, Emana, and Ketema 2012, 873)	not operationalized		
Determinants of resilience	Yes	important determinants for resilience at household level in North Shewa zone of Ethiopia. (Tesso, Emana, and Ketema 2012)(Tesso, Emana, and Ketema 2012, 872)	Yes		The independent variables included in the model were avail- ability of food stock(dummy), income diversification (number of enterprises), number of plots, number of de- pendent family members, age of household head (years), access to credit (dummy), social capital (number of in- stitutional involvement), area under perennial crops (ha), preparedness (dummy), propensity to invest on natural resources (percentage of area under conservation), pro- pensity to save

					(percentage of saving), access to irriga- tion (ha), geographic locations (dummy), etc. βs are pa- rameters estimated and Uij is the disturbance term (Tesso, Emana, and Ketema 2012, 875)
Exposure	Yes	Furthermore, in the IPCC frame- work, exposure has an external dimension, whereas both sensitivity and adaptive capacity have an internal dimen- sion, which is implicitly assumed in the integrated vul- nerability assessment framework [13]. (Tesso, Emana, and Ketema 2012, 873)	not operationalized		
fast bouncing back	Yes	 households that were fast in bouncing back; which means households that have gone back to their normal agricultural operation in the following production season; (Tesso, Emana, and Ketema 2012, 874) 	No	Household level resilience	
household level resilience	Yes	According to DFID, resil- ience at community level is explained as the ability of countries, communities and households to manage change, by maintaining or transforming living standards in the face of shocks or stresses—such as earthquakes, drought or violent conflict—without compromising their long- term prospects [10]. Similarly, resilience is the ability of a social or ecological system to absorb disturbances while retaining the same basic structure and ways of functioning, the capacity for self-organization, and the capacity to adapt to stress and change. This is a meas- urement of community's capacity to absorb external shocks. In the aftermath of occurrence of climate	Yes		In this research, a farmer is said to have fully bounced back, when it begins its lively- hood operation as time before the shock. The speed of bouncing back was measured by number of agricul- tural seasons taken to bounce back to their livelihood without external intervention by government or non- governmental organization. (Tesso, Emana, and Ketema 2012, 874)

		change induced shocks, how do farmer bounce back to normal livelihood is about the resilience level of farming com- munity. A resilient community is able to respond to changes or stress in a positive way, and is able to main- tain its core functions as a community despite those stresses [11]. (Tesso, Emana, and Ketema 2012, 871, 872)			
household vulnerability to climate change	Yes	Therefore, vulner- ability is the degree to which a system is susceptible or unable to cope with the adverse effects of climate change, including climate variability and extremes. In this regard, vulnerability is a function of the character, magnitude, and rate of climate variation to which a system is ex- posed, its sensitivity, and its adaptive capacity [4]. (Tesso, Emana, and Ketema 2012, 871)	Not operationalized		
moderate bouncing back	Yes	2) moderate in bouncing back; which means households which took one to two agricultural seasons to get back to normal operation as before the event; (Tesso, Emana, and Ketema 2012, 874)	No	Household level resilience	
Sensitivity	Yes	According to Füssel and Klein, the risk- hazard framework (biophysical approach) corresponds most closely to sensitivity in the IPCC ter- minology while the adaptive capacity (broader social development) is largely consistent with the socioeco- nomic approach [18]. (Tesso, Emana, and Ketema 2012, 873)	Not operationalized		
slow bouncing back	Yes	3) slow in bouncing back; which means households which were unable to	No	Household level resilience	

bounce back within one to two agricultural seasons to their normal	
livelihood activities.	
(Tesso, Emana, and Ketema 2012, 874)	

<u>Construct</u>	Defined?	Definition or further info	Directly	Indirectly	Operational text
			Operationalized?	operationalized	
				<u>through:</u>	
adaptation strategy	Yes	Adaptations, or adaptive strategies, employed by individuals or groups are depicted as being mediated through their relative adaptive capacities, indicating that adaptations may or may not be accessed according to the distribution of various types of resources such as physical or social capital, as developed by Adger and Kelly (1999). (Westerhoff and Smit 2009, 321)	Yes	<u>tnrougn:</u>	This model of vulnerability was used as a guiding framework for the empirical assessment of the vulnerability of the case study community of Mimkyemfre in the Afram Plains (Kwahu North) district of Ghana. Current exposure-sensitivities, adaptive strategies and adaptive capacities of the community are documented and explained in order to provide a basis for understanding vulnerability to future changes in climate and other environments. These were determined using a community-based approach similar to those used by Burton et al. (2002), Ford and Smit (2004) and Schröter et al. (2005), in which the factors and forces relevant to the community vulnerability were sought via primary and secondary sources. A key element of the approach is to engage community members as necessary sources of information on the conditions to which they are exposed and how they are sensitive, the adaptive strategies they have employed, and the conditions that constrain or facilitate these strategies. This detailed analysis of current vulnerability identifies opportunities for adaptive

				basis for estimating future vulnerabilities by extending processes of exposure- sensitivity and adaptive capacity, and by incorporating projections of future climate change and other conditions. (Westerhoff and Smit 2009, 322)
Adaptive capacity	Yes	Adaptive capacity (broadly consistent with social resilience) is also reflective of both the natural resource base and the social, economic, cultural and political conditions that facilitate or constrain adaptations to changing environments. (Westerhoff and Smit 2009, 321)	Yes	This model of vulnerability was used as a guiding framework for the empirical assessment of the vulnerability of the case study community of Mimkyemfre in the Afram Plains (Kwahu North) district of Ghana. Current exposure-sensitivities, adaptive strategies and adaptive capacities of the community are documented and explained in order to provide a basis for understanding vulnerability to future changes in climate and other environments. These were determined using a community-based approach similar to those used by Burton et al. (2002), Ford and Smit (2004) and Schröter et al. (2005), in which the factors and forces relevant to the community vulnerability were sought via primary and secondary sources. A key element of the approach is to engage community members as necessary sources of information on the conditions to which they are exposed and how they are sensitive, the adaptive strategies they have employed, and the conditions that constrain or facilitate these strategies. This detailed analysis of current vulnerability identifies opportunities for adaptive interventions or initiatives, and provides a basis for estimating future vulnerabilities by extending processes of exposure- sensitivity and adaptive capacity, and by incorporating projections of future climate

				change and other conditions. (Westerhoff and Smit 2009, 322)
biophyisical conditions	No			
exposed and sensitive to climate change	Yes	People's exposures and sensitivities to external conditions are influenced by their occupancy and livelihood characteristics, and the nature and degree to which these are affected by the external stresses. (Westerhoff and Smit 2009, 321)	Yes	This model of vulnerability was used as a guiding framework for the empirical assessment of the vulnerability of the case study community of Mimkyemfre in the Afram Plains (Kwahu North) district of Ghana. Current exposure-sensitivities, adaptive strategies and adaptive capacities of the community are documented and explained in order to provide a basis for understanding vulnerability to future changes in climate and other environments. These were determined using a community-based approach similar to those used by Burton et al. (2002), Ford and Smit (2004) and Schröter et al. (2005), in which the factors and forces relevant to the community vulnerability were sought via primary and secondary sources. A key element of the approach is to engage community members as necessary sources of information on the conditions to which they are exposed and how they are sensitive, the adaptive strategies they have employed, and the conditions that constrain or facilitate these strategies. This detailed analysis of current vulnerability identifies opportunities for adaptive interventions or initiatives, and provides a basis for estimating future vulnerabilities by extending processes of exposure- sensitivity and adaptive capacity, and by incorporating projections of future climate change and other conditions. (Westerhoff and Smit 2009, 322)

local scale vulnerability	Yes	Vulnerability at a local scale is shown as nested within other scales, including the effects that broad-scale forces have on processes of local vulnerability and vice versa. The dynamic nature of vulnerability is indicated by the layers of the components of vulnerability and of the interacting biophysical and socioeconomic forces. (Westerhoff and Smit 2009, 322)	No	Adaptive capacity; Exposed and sensitive to climate change; adaptation strategy	
multiple underlying forces	Yes	n summary, research on practical adaptations to effectively address the vulnerability of people to climate change has recognized the need to identify the factors in addition to climate that contribute to vulnerability, including the multiple forces and dynamic processes that occur at both local and broader scales. (Westerhoff and Smit 2009, 320)	Yes		This model of vulnerability was used as a guiding framework for the empirical assessment of the vulnerability of the case study community of Mimkyemfre in the Afram Plains (Kwahu North) district of Ghana. Current exposure-sensitivities, adaptive strategies and adaptive capacities of the community are documented and explained in order to provide a basis for understanding vulnerability to future changes in climate and other environments. These were determined using a community-based approach similar to those used by Burton et al. (2002), Ford and Smit (2004) and Schröter et al. (2005), in which the factors and forces relevant to the community vulnerability were sought via primary and secondary sources. A key element of the approach is to engage community members as necessary sources of information on the conditions to which they are exposed and how they are sensitive, the adaptive strategies they have employed, and the conditions that constrain or facilitate these strategies. This detailed analysis of current vulnerability identifies opportunities for adaptive

			interventions or initiatives, and provides a basis for estimating future vulnerabilities by extending processes of exposure- sensitivity and adaptive capacity, and by incorporating projections of future climate change and other conditions. (Westerhoff and Smit 2009, 322)
socio-economic conditions	No		

Appendix D: Summary of article-specific constructs identified

Article	Constructs	Defined?	Directly operationalized?
(Antwi-Agyei et al. 2013)	Access to livelihood capital assets	Yes	Not operationalized
	Adaptive capacity	Yes	No
	Climatic risk	Yes	Not operationalized
	Community	Yes	Yes
	Diversified livelihood activities	Yes	Yes
	Drought	No	
	Exposure	Yes	Yes
	Financial capital	Yes	Yes
	Household	Yes	No
	Human Capital	Yes	Yes
	Livelihood capital assets	Yes	No
	Livelihoods	Yes	No
	Natural capital	Yes	Yes
	Physical capital	Yes	Yes
	Resilience	Yes	No
	Resilient and vulnerable communities	Yes	Yes
	Resilient and vulnerable households	No	
	Sensitivity	Yes	No
	Social capital	Yes	Yes
	Socio-economic, environmental, and	No	
	community characteristics		
	Vulnerability	Yes	No
(Baca et al. 2014)	Adaptation strategies	No	
· · ·	Adaptive capacity	Yes	Yes
	Exposure	Yes	Yes
	Sensitivity	Yes	Yes
	Vulnerability of coffee farming	Yes	No
	communities		
(Berkes and Ross 2013)	Adaptive capacity	Yes	not operationalized
	Agency	No	
	Community resilience	Yes	not operationalized
	Self-organising	No	
(Bogale, Taeb, and Endo	Common property	No	
2006)	Household choice	No	
	Private property	No	
	Property rights	Yes	Not operationalized
	Property rights regime	Yes	Not operationalized
	Public property	No	•
	Vulnerability	No	
(Calvo and Dercon 2013)	Aggregate vulnerability	Yes	No
	Covariant shocks	No	
	Idiosyncratic shocks	No	
	Individual vulnerability	Yes	No
	Possible states of the world	Yes	Yes

	Poverty line	Yes	Yes
	Probabilities of possible states of the	Yes	Yes
	world		
	Shocks	No	
	Vulnerability to poverty	Yes	No
	vulnerability	Yes	No
(Capaldo et al. 2010)	Access to food	Yes	Not operationalized
(00000000000000000000000000000000000000	Chronically food insecure	Yes	No
	Current exposure to risk	YES	Yes
	Current socio-economic characteristics	YES	Yes
	Events	Yes	No
	Expected future food security status	Yes	No
	Food availability	Yes	Not operationalized
	Food consumption	Yes	Not operationalized
	Food security	Yes	No
	Food utilization	Yes	Not operationalized
	Future food security	Yes	Not operationalized
	Future nutritional status	Yes	Not operationalized
	Permanently food secure	Yes	No
	Present characteristics	Yes	No
	Present food security status	Yes	No
	Risk management	Yes	Yes
	Risks	Yes	Yes
	Transitory food insecure	Yes	No
	Transitory food secure	Yes	No
	Vulnerability	Yes	Not operationalized
	Vulnerability to future food insecurity	Yes	No
(CARE 2009)	Adaptation to climate change	Yes	Not operationalized
(0) (112 2003)	adaptive capacity	Yes	Yes
	Climate change	Yes	Not operationalized
	community level	No	
	financial capital	No	
	Hazard	Yes	yes
	human capital	No	yes
	natural capital	No	
	physical capital	No	
	Resilience	Yes	Yes
	social cpaital	No	
	vulnerability to climate change	Yes	No
(Chhihn and Poch 2012)	Climate change	No	
(Current poverty status	Yes	Yes
	Environmental shocks	Yes	Yes
	Farmers	No	
	Household characteristics	Yes	Yes
	Household vulnerability as expected	Yes	No
	poverty		
	Households	No	
	Natural hazards	No	
	Poverty	Yes	Yes
(Dasgupta and Baschieri	Asset vulnerability	Yes	no
2010)	Climate shocks	Yes	No
	Cirriate Shocks	103	

	Communities	No	
	Communities at risk of climate shocks	No	
	Drought	Yes	Yes
	Household relations	Yes	Not operationalized
	Household vulnerability to climate	Yes	No
	change	105	
	Human capital	Yes	Yes
	Labour	Yes	Yes
	Non-labour productive assets	Yes	Yes
	Prepared for adverse consequences	No	
	Risk of experiencing climate change shock	Yes	Yes
	Social capital	Yes	Yes
	Welfare of rural households	No	
(Deressa, Hassan, and	Climate and non-climate shocks	No	
Ringler 2009)	Ethiopean Farmers	No	
	Expected Poverty	Yes	No
	Household consumption (income)	No	
	Minimum consumption (income) level	Yes	Yes
	Vulnerability	Yes	No
(Eakin, Winkels, and	Cross- scalar teleconnection	Yes	No
Sendzimir 2009)	Exogenous drivers	Yes	Yes
,	Geographically distant household vulnerability	Yes	Yes
	Geographically specific signals of change	Yes	Yes
	Household responses	Yes	Yes
	Livelihood vulnerability	Yes	No
	Nested and teleconnected livelihood	Yes	No
	vulnerability		
	Nested system	Yes	Yes
	Response outcome	Yes	Yes
(Eakin et al. 2012)	Adaptiveness	Yes	No
· · · ·	Disaster	No	
	Impacts & responses to Hurricane Stan by coffee farmers	Yes	yes
	Resilience	Yes	No
	Resilience of rural livelihoods	Yes	No
	Vulnerability	Yes	No
(Échevin 2011)	Community level	Yes	Yes
/	Covariate shocks	No	
	Determinants of poverty and	No	
	vulnerability		
	Economic well-being	Yes	No
	Household vulnerability to poverty	Yes	No
	Household level	Yes	Yes
	Idiosyncratic shocks	No	
	Observable covariate shocks	No	
	Observable idiosyncratic shocks	No	
	Poverty	Yes	No

	Unobservable covariate shocks	No	
	unobservable idiosyncratic shocks	No	
	vulnerability	Yes	No
(Ford and Smit 2004)	current adaptive capacity	Yes	No
	Current exposure	Yes	No
	Current vulnerability	Yes	yes
	future adaptive capacity	Yes	yes
	future climate probabilities	No	
	future exposure	Yes	yes
	future social probability	No	
	Future vulnerability	Yes	No
	vulnerability to climate risks	Yes	No
(Füssel and Klein 2006)	Adaptation	Yes	not operationalized
(Fussel and Kielin 2000)	Adaptation	Yes	not operationalized
	-		· ·
	Adaptation-implmentation	Yes	not operationalized
	Adaptive capacity	Yes	not operationalized
	Climate change	Yes	not operationalized
	Climate variability	Yes	not operationalized
	concentrations	No	
	Emissions	No	
	Exposure	Yes	not operationalized
	Impacts	Yes	not operationalized
	Mitigation	Yes	not operationalized
	Mitigative capacity	Yes	not operationalized
	Mitigation Faciliation	Yes	not operationalized
	Mitigation-implementation	Yes	not operationalized
	Non-climatic drivers	Yes	not operationalized
	Non-climatic factors	Yes	not operationalized
	Sensitivity	Yes	not operationalized
	Vulnerability	Yes	not operationalized
(Gandure, Walker, and	Actual meterological observation	Yes	Yes
Botha 2013)	Adaptation to long term climate change	Yes	Yes
	Climatic risk factors	No	
	Experience of long term climate change	Yes	Not operationalized
	Livelihood risks	No	
	Non-climatic risk factors	No	
	Perception of long term climate change	Yes	Yes
(Günther and Harttgen	Community level	Yes	Yes
2009)	Covariate shocks	Yes	yes
	Household level	Yes	Yes
	Household vulnerability to poverty	Yes	No
	Idiosyncratic shocks	Yes	Yes
	Risk-induced poverty	Yes	No
	Structural poverty	Yes	Yes
(Hahn, Riederer, and	2 week illness	Yes	Yes
Foster 2009)	Adaptive capacity	Yes	No
	agriculture dependend households	Yes	Yes
	average precipitation	Yes	Yes
	borrow-lend ratio	Yes	Yes
		Yes	Yes
	crop diversity		
	dependency ratio	Yes	Yes

	don't save crops	Yes	Yes
	don't save seeds	Yes	Yes
	Exposure	Yes	No
	family with cronic illness	Yes	Yes
	flood, drought, cyclone events	Yes	Yes
	Food	Yes	No
	food from family farm	Yes	Yes
	-		
	Health	Yes	No
	households with orphans	Yes	Yes
	households working elsewhere	Yes	Yes
	idendependent of local government	Yes	Yes
	inconsistent water suply	Yes	Yes
	injury or death from disaster	Yes	Yes
	inverse water stored	Yes	Yes
	livelihood diversification	Yes	Yes
	Livelihood strategies	Yes	No
	Livelihood vulnerability	Yes	No
	malaria exposure-prevention	Yes	Yes
	maximum temperature	Yes	Yes
	minimum temperature	Yes	Yes
	Natural disasters and Climate variability	Yes	No
	natural water source	Yes	Yes
	no warning of disaster	Yes	Yes
	precent of female-headed households	Yes	Yes
	proximity to health facility	Yes	Yes
	proximity to water source	Yes	Yes
	receive-give ratio	Yes	Yes
	Sensitivity	Yes	No
	social networks	Yes	No
	Socio-demographic profile	Yes	No
	struggle for food	Yes	Yes
	uneducated headed households	Yes	Yes
	Vulnerability ipcc	Yes	No
	Water	Yes	No
	water conflict	Yes	Yes
(Ionesco et al. 2009)	adaptive capacity	No	
(10116300 Ct al. 2003)	adaptive capacity as set	Yes	Yes
	effective action	Yes	No
		Yes	Yes
	Entity		Not operationalized
	hazard potential impact	Yes	
	preference criteria	Yes	Yes
	reference scenarios	Yes	Yes
	relative hazards	Yes	Not operationalized
	Stimulus	Yes	yes
	unavoidable hazards	Yes	Not operationalized
	Vulnerability	Yes	No
(Jamir et al. 2013)	Adaptive capacity	Yes	Yes
	Agricultural	Yes	Yes
	Biophysical	Yes	Yes
	Climate-relted extrement events	No	
	Demographic	Yes	Yes

	Drought	Yes	Yes
	Exposure	Yes	Yes
	Sensitivity	Yes	Yes
	Socio-economic	Yes	Yes
	Sources of vulnerability	Yes	No
	· · ·	No	NO
	Village level Vulnerability		No
(Khan and Calman 2012)		Yes	No
(Khan and Salman 2012)	Coping capacity	Yes	No
	Damage potential	Yes	No
	Lack of decent housing	Yes	Yes
	Lack of decent standard of living	Yes	Yes
	Lack of knowledge	Yes	Yes
	Livestock households and farm	Yes	Yes
	households		
	Population density	Yes	Yes
	Regional vulnerability	Yes	No
(Luers et al. 2003)	Adaptive capacity	Yes	Yes
	Exposure	Yes	Yes
	Sensitivity	Yes	Yes
	State of system relative to threshold of	Yes	Yes
	damage		
	Threshold of damage	Yes	Yes
	Vulnerability as suceptability	Yes	No
	Well-being	Yes	Yes
(Marshall 2010)	ability to plan, learn, reorganise	Yes	Yes
	Adpative capacity	Yes	Yes
	interest n change	Yes	Yes
	perception of risk	Yes	Yes
	proximity to coping threshold	Yes	Yes
	Resilience	No	
	resource dependency	Yes	Yes
	use of forecasts	Yes	Yes
(Mengistu 2011)	Adaptation strategies	No	
	Climate change	No	
	Climate forecast methods	No	
	Coping strategies	No	
	Drought early warning systems	No	
	Knowledge of farmers	No	
	Perception of Adiha farmers	Yes	Yes
(Misselhorn 2005)	Access to food	No	
·	Access to sufficient food	No	
	Direct drivers	No	
	Food insecurity	Yes	not operationalized
	Food production	No	· · ·
	Household and community	Yes	not operationalized
	vulnerability		
	vunierability		
		No	
	Indirect drivers	No No	
			not operationalized

	Climate change and variability	Yes	Yes
	Climate variability	Yes	Yes
	Farmer perceptions	Yes	Yes
	Non-climatic stress	Yes	Yes
	Threat to livelihoods	No	fes
(Mutavangua 2011)			Yes
(Mutsvangwa 2011)	Cereal production	Yes	fes
	Climate change Expected food insecurity	No	No
		Yes	No
	food insecurity	No	
	small holder farmers	No	
	Vulnerability	Yes	Yes
	vulnerability threshold	Yes	Yes
	welfare indicator	Yes	No
(Nkondze, Masuku, and Manyatsi 2013)	Household vulnerability to climate change	No	
	Factors affecting vulnerability	No	
(Notenbaert et al. 2013)	Adaptive capacity	Yes	No
	Exposure	Yes	Yes
	Institutional environment	Yes	Yes
	Livelihood assets	Yes	Yes
	Livelihood strategies	Yes	Yes
	Livelihoods	Yes	Yes
	Response and management options	Yes	No
	Risks	Yes	Yes
	sensitivity	Yes	No
	Vulnerability	Yes	No
	Vulnerability outcomes	Yes	Yes
(Piya, Maharjan, and Joshi	Adaptive capacity	Yes	No
2012)	Exposure	Yes	Yes
	Financial capital	Yes	Yes
	Human capital	Yes	Yes
	Livelihood assets	Yes	No
	Local level vulnerability	Yes	No
	Natural capital	Yes	Yes
	Physical capital	Yes	Yes
	Sensitivity	Yes	Yes
	Social capital	Yes	Yes
(Sallu, Twyman, and	dynamic natural resource base	Yes	Yes
Stringer 2010)	factors influencing resilience and	Yes	Yes
2010)	vulnerability	105	
	livelihood trajectories	Yes	Yes
	resilience and vulnerability of rural	yes	No
	livelihoods	yes	
(Sarris and Karfakis 2010)	cash crop growing households	No	
	covariate shocks	Yes	Yes
	crop-growing households	No	
	household consumption	Yes	Yes
	household socio-economic	No	
	characteristics		
	idiosyncratic shocks	Yes	Yes
	non-cash crop growing households	no	

	Rural household vulnerability	Yes	Not operationalized
(Sietz, Choque, and	access to food	Yes	not operationalized
Lüdeke 2012)	adaptive capacity	Yes	Yes
	cluster pattern analysis	Yes	Yes
	Exposure	Yes	Yes
	food availability	Yes	No operationalized
	food security	Yes	yes
	household characterisitcs	No	
	Sensitivity	Yes	Yes
	Vulnerability	Yes	No
	vulnerability creating mechanisms	No	
	weather extremes	No	
(Tesso, Emana, and	adaptive capacity	Yes	not operationalized
Ketema 2012)	Determinants of resilience	Yes	Yes
	Exposure	Yes	not operationalized
	fast bouncing back	Yes	No
	household level resilience	Yes	Yes
	household vulnerability to climate change	Yes	Not operationalized
	moderate bouncing back	Yes	No
	Sensitivity	Yes	Not operationalized
	slow bouncing back	Yes	No
(Westerhoff and Smit	adaptation strategy	Yes	Yes
2009)	Adaptive capacity	Yes	Yes
	biophyisical conditions	No	
	exposed and sensitive to climate change	Yes	Yes
	local scale vulnerability	Yes	No
	multiple underlying forces	Yes	Yes
	socio-economic conditions	No	
Total	358	281	154

Appendix E: Selection of framework-defining emic constructs

Bridging Framework	Common	Common	Articles	Common bar 2	Articles	Comm	Article
code	constructs	bar 1	omittin g		omittin g	on bar 3	s omitti ng
[IPCC][Livelihoodsity;integrated intoVulnerabilIPCC][Residual7]ity ofcoffeefarmingcommunities;vulnerability toclimatechange;Vulnerability ipcc;Vulnerability ipcciVulnerability ipcciVulnerability ipcciVulnerability; locallevelvulnerability;(2)Adaptive	Vulnerabil ity of coffee farming communit	Exposure	(CARE 2009)				
	vulnerabil ity to climate change; Vulnerabil ity ipcc; Vulnerabil ity as suceptabil ity; local level vulnerabil ity;	Sensitivity	(CARE 2009)				
unchanged [ie VEP]		Vulnerability ; Rural household vulnerability	(Chhihn and Poch 2012)	household characteristi cs; household consumption	(Deressa , Hassan, and Ringler 2009); (Calvo and Dercon 2013)		
		Expected poverty; household vulnerability as expected poverty; vulnerability to poverty	(Sarris and Karfakis 2010)	covariant shocks; covariate shocks	(Deressa , Hassan, and Ringler 2009); (Chhihn and Poch 2012)		
		Household consumptio n (income);	(Calvo and Dercon	idiosyncratic shocks; idiosyncratic	(Deressa , Hassan, and		

		household consumptio n; current poverty status minimum consumptio n (income) level; poverty; Poverty line Climate and non-climate	2013) (Sarris and Karfakis 2010) (Sarris and	shocks	Ringler 2009); (Chhihn and Poch 2012)	
		shocks; environmen	Karfakis 2010)			
		tal shocks; shocks				
Merged [Food Security][VE Food security]	 (1) Expected food insecurity ; expected future food security status; (2) food insecurity ; vulnerabil ity to future food insecurity ; (3) future nutriciona l status; welfare indicator (4) vulnerabil ity 					
	vulnerability					
	to poverty household					
	level community level					
	risk-induced poverty;					

	Determinants					
	of Poverty &					
	Vulnerability	-				
	idiosyncratic					
	shocks					
	covariate					
	shocks				-	
Merged	climate	Farmer	(Westerh	Perception	(Mubaya	
[Residual6][Residual	change and	perceptio	off and	of long	et al.	
11]	variability;	ns;	Smit	term	2012);	
[Residual12][Residu	biophyisical	Experienc	2009)	climate	(Westerho	
al16]	conditions;	e of long		change;	ff and Smit	
	climatic risk	term		knowledge	2009)	
	factors;	climate		of farmers		
	climate	change;				
	change	Perceptio				
		n of Adida				
		farmers				
		non-	(Mengistu			
		claimtic	2011)			
		stress;				
		socio-				
		economic				
		condition				
		s; non-				
		climatic				
		risk				
		factors	(Mongistu	actual	(Mubaya	
		threat to livelihood	(Mengistu 2011)	actual	(Mubaya et al.	
		s;	2011)	meterologi cal	2012);	
		s, exposed		observatio	(Westerho	
		and		ns; climate	ff and Smit	
		sensitive		forecast	2009)	
		to climate		methods;	_0007	
		change;		drought		
		livelihood		early		
		risks		warning		
		adaptatio	(Mubaya	system		
		n	et al.			
		strategy;	2012)			
		adaptatio	,			
		n ot long				
		term				
		climate				
		change;				
		coping				
		strategies				
Residual 1 (Berkes &	Agency					
Ross)	Adaptive					
	conocity					
	capacity Community					

	D 11	
	Resilience	
	Sefl-	
	organising	
Residual 2 Bogale et	Propoerty	
al	rights	
	Propoerty	
	rights regime	
	household	
	choice	
	Vulnerability	
	private	
	property	
	public	
	property	
Residual 3 Dasgupta	Welfare of	
& baschieri	rural	
	housholds	
	household	
	vulnerability	
	to climate	
	change	
	Asset	
	vulnerability	
	communities	
	at risk of	
	climate shocks	
	prepared for	
	adverse	
	consequences	
	risk of	
	experiencing	
	climate	
	change shock	
Residual 4 Eakin et	Adaptiveness	
al 2012	Disaster	
	Impacts &	
	responses to	
	Hurricane	
	Stan by coffee	
	farmers	
	Resilience	
	Resilience of	
	rural	
	livelihoods	
	vulnerability	
Residual 5 Ford &	vulnerability	
Smit	to climate	
	risks	
	Current	
	vulnerability	
	Future	
	vulnerability	

	Current	
	exposure	
	current	
	adaptive	
	capacity	
	future	
	exposure	
Residual 8 Ionesco	adaptive	
et al	capacity	
	Vulnerability	
	Stimulus	
	Entity	
	preference	
	criteria	
	reference	
	scenarios	
Residual 9 Khan &	regional	
Salman	vulnerability	
	damage	
	potential	
	coping	
	capacity	
	Population	
	density	
	Lack of decent	
	standard of	
	living	
	Lack of decent	
	housing	
Residual 10	Resilience	
Marshall	Adpative	
	capacity	
	use of	
	forecasts	
	resource	
	dependency	
	perception of	
	risk	
	ability to plan,	
	learn,	
	reorganise	
Residual 13	factors	
Nkondze et al	afecting	
	vulnerability	
	Household	
	vulnerability	
	to climate	
	change	
Residual 14 Sietze	Vulnerability	
et al	Exposure	
	Sensitivity	
	Adaptive	

	capacity	
	cluster	
	pattern	
	analysis	
	Food security	
Residual 15 Tesso et	household	
al	vulnerability	
	to climate	
	change	
	Exposure	
	Sensitivity	
	Adaptive	
	capacity	
	Determinants	
	of resilience	
	household	
	level	
	resilience	
Residual 17 Eakin et	Livelihood	
al 2008	vulnerability	
	nested and	
	teleconnected	
	livelihood	
	vulnerability	
	cross-scalar	
	teleconnectio	
	n	
	response	
	outcomes	
	exogenous	
	drivers	
	Nested system	
Food Security –	livelihood	
Livelihoods	level issues	
Misselhorn	access to	
	sufficient food	
	Food	
	insecurity	
	Livelihood	
	strategies	
	household	
	and	
	community	
	vulnerability	
	Direct drivers	
Livelihoods A Hahn	Livelihood	
et al A	vulnerability	
	Socio-	
	demographic	
	profile	
	Livelihood	
	strategies	

	Llaalth
	Health
	Water
	Natural
	disasters and
	Climate
	variability
Livelihoods B – Sallu	resilience and
et al	vulnerability
	of rural
	livelihoods
	factors
	influencing
	resilience and
	vulnerability
	dynamic
	natural
	resource base
	livelihood
	trajectories

Appendix F: Record of within-comparison of emic constructs (Step 2.12)

Record of within-com Emic construct	Appears in	Definitions	Decision	Selected
				representative for across- comparison
ability to plan, learn, reorganise	(Marshall 2010)	A description of each dimension can be found in Marshall and Marshall (2007). (Marshall 2010, 38)	Default	Default
access to sufficient food	(Misselhorn 2005)	NOT DEFINED	Default	Default
adaptation ot long term climate change	(Gandure, Walker, and Botha 2013)	Unique in our study, is the use of individual perceptions in identifying and understanding the processes of adaptation in an area that has undergone significant political and socio-economic reformation resulting from a series of conflicts over land resources. (Gandure, Walker, and Botha 2013, 40)	Default	Default
adaptation strategy	(Westerhoff and Smit 2009)	Adaptations, or adaptive strategies, employed by individuals or groups are depicted as being mediated through their relative adaptive capacities, indicating that adaptations may or may not be accessed according to the distribution of various types of resources such as physical or social capital, as developed by Adger and Kelly (1999). (Westerhoff and Smit 2009, 321)	Default	Default
adaptive capacity	(Antwi-Agyei et al. 2013)	Adaptive capacity in the context of climate change has been defined by the IPCC (2007, p. 869)as "the ability of a system to adjust to climate change (including climate variability and extremes) to moderate potential damages, to take advantage of opportunities, or to cope with the consequences." Adaptive capacity connotes some positive attributes of a system that enable it to reduce the adverse impacts (vulnerability) associated with climate change (Engle 2011). (Antwi-Agyei et al. 2013, 905)	Adaptive capacityA = {(Antwi-Agyei et al. 2013); (Baca et al. 2014); (CARE 2009); (Füssel and Klein 2006); (Hahn, Riederer, and Foster 2009); (Jamir et al. 2013); (Luers et al. 2003); (Notenbaert	Adaptive Capacity A: (Füssel and Klein 2006)
	(Baca et al. 2014)	In contrast, adaptive capacity is defined as a system's ability to adjust to climate change in order to reduce or mitigate possible damage [3]. Adaptive capacity	et al. 2013); (Piya, Maharjan, and Joshi	Adaptive capacity B: (Marshall 2010)

ГТ			
(Berkes an Ross 2013)		2012); (Tesso, Emana, and Ketema 2012)} Adaptive capacityB = {(Berkes and Ross 2013); (Marshall 2010)} Adaptive capacity C = {(Sietz, Choque, and Lüdeke 2012)} Variance = {(Ionesco et al. 2009)}	Adaptive capacity C: (Sietz, Choque, and Lüdeke 2012)
(CARE 200	D) The ability of a system to adjust to climate change (including climate variability and extremes) to moderate potential damages, to take advantage of opportunities, or to cope with the consequences.6		
(Füssel and Klein 2006			
(Hahn, Riederer, a Foster 200 (Ionesco e al. 2009) (Jamir et a	9) exposure (Ebi et al., 2006). (Hahn, Riederer, and Foster 2009, 75)	-	
2013)	framework, vulnerability is understood as a function of three components—exposure, sensitivity and adaptive capacity. Vulnerability is defined as "the degree to which a		

	system is susceptible to or unable to	
	cope with, adverse effects of climate	
	change, including cli- mate variability	
	and extremes" (IPCC 2001).	
	(Jamir et al. 2013, 154)	
(Luers et al.	We define adaptive capacityas the	
2003)	extent to which a	
	system can modify its circumstances to	
	move to a less vulnerable condition	
	(Fig. 1c). We quantifyadaptive	
	capacity(A) as the difference in the	
	vulnerabilityunder existing conditions	
	and under the less vulnerable condition	
	to which the system could potentially	
	shift:	
	A ¼ Vðexisting conditionsÞ🛛 Vðmodified	
	conditions ^p :	
	(Luers et al. 2003)(Luers et al. 2003,	
	259)	
(Marshall	It refers to the ability of individuals or	
2010)	communities to adapt to adversity and	
2010)	stressful life-events by 'reorganising'	
	through networks or institutions that	
	learn, store knowledge and experi- ence	
	and are creative, flexible and novel in	
	their approach to problem solving	
	(Vayda and McCay, 1975; McCay, 1981;	
	Sonn and Fisher, 1998).	
	(Marshall 2010, 37)	
(Notenbaert	the risk response or the options that	
(Notenbaert et al. 2013)	the risk response or the options that	
(Notenbaert et al. 2013)	people have for managing these risks	
	people have for managing these risks (Turner et al. 2003).	
et al. 2013)	people have for managing these risks (Turner et al. 2003). (Notenbaert et al. 2013, 460)	
et al. 2013) (Piya,	people have for managing these risks (Turner et al. 2003). (Notenbaert et al. 2013, 460) Adaptive capacity is the ability of a	
et al. 2013) (Piya, Maharjan,	people have for managing these risks (Turner et al. 2003). (Notenbaert et al. 2013, 460) Adaptive capacity is the ability of a system to adjust to climate change	
et al. 2013) (Piya, Maharjan, and Joshi	people have for managing these risks (Turner et al. 2003). (Notenbaert et al. 2013, 460) Adaptive capacity is the ability of a system to adjust to climate change including climate variability and	
et al. 2013) (Piya, Maharjan,	people have for managing these risks (Turner et al. 2003). (Notenbaert et al. 2013, 460) Adaptive capacity is the ability of a system to adjust to climate change including climate variability and extremes, to moderate the potential	
et al. 2013) (Piya, Maharjan, and Joshi	people have for managing these risks (Turner et al. 2003). (Notenbaert et al. 2013, 460) Adaptive capacity is the ability of a system to adjust to climate change including climate variability and extremes, to moderate the potential damage from it, to take advantage of its	
et al. 2013) (Piya, Maharjan, and Joshi	people have for managing these risks (Turner et al. 2003). (Notenbaert et al. 2013, 460) Adaptive capacity is the ability of a system to adjust to climate change including climate variability and extremes, to moderate the potential damage from it, to take advantage of its opportunities, or to cope with its	
et al. 2013) (Piya, Maharjan, and Joshi	people have for managing these risks (Turner et al. 2003). (Notenbaert et al. 2013, 460) Adaptive capacity is the ability of a system to adjust to climate change including climate variability and extremes, to moderate the potential damage from it, to take advantage of its opportunities, or to cope with its consequences. Selection of indicators	
et al. 2013) (Piya, Maharjan, and Joshi	people have for managing these risks (Turner et al. 2003). (Notenbaert et al. 2013, 460) Adaptive capacity is the ability of a system to adjust to climate change including climate variability and extremes, to moderate the potential damage from it, to take advantage of its opportunities, or to cope with its consequences. Selection of indicators for adaptive capacity is based on the	
et al. 2013) (Piya, Maharjan, and Joshi	people have for managing these risks (Turner et al. 2003). (Notenbaert et al. 2013, 460) Adaptive capacity is the ability of a system to adjust to climate change including climate variability and extremes, to moderate the potential damage from it, to take advantage of its opportunities, or to cope with its consequences. Selection of indicators for adaptive capacity is based on the DFID sustainable livelihoods framework,	
et al. 2013) (Piya, Maharjan, and Joshi	people have for managing these risks (Turner et al. 2003). (Notenbaert et al. 2013, 460) Adaptive capacity is the ability of a system to adjust to climate change including climate variability and extremes, to moderate the potential damage from it, to take advantage of its opportunities, or to cope with its consequences. Selection of indicators for adaptive capacity is based on the DFID sustainable livelihoods framework, whereby adaptive capacity is taken to	
et al. 2013) (Piya, Maharjan, and Joshi	people have for managing these risks (Turner et al. 2003). (Notenbaert et al. 2013, 460) Adaptive capacity is the ability of a system to adjust to climate change including climate variability and extremes, to moderate the potential damage from it, to take advantage of its opportunities, or to cope with its consequences. Selection of indicators for adaptive capacity is based on the DFID sustainable livelihoods framework, whereby adaptive capacity is taken to be a function of asset possession by the	
et al. 2013) (Piya, Maharjan, and Joshi	people have for managing these risks (Turner et al. 2003). (Notenbaert et al. 2013, 460) Adaptive capacity is the ability of a system to adjust to climate change including climate variability and extremes, to moderate the potential damage from it, to take advantage of its opportunities, or to cope with its consequences. Selection of indicators for adaptive capacity is based on the DFID sustainable livelihoods framework, whereby adaptive capacity is taken to be a function of asset possession by the households (Jakobsen, 2011; Nelson, et	
et al. 2013) (Piya, Maharjan, and Joshi	people have for managing these risks (Turner et al. 2003). (Notenbaert et al. 2013, 460) Adaptive capacity is the ability of a system to adjust to climate change including climate variability and extremes, to moderate the potential damage from it, to take advantage of its opportunities, or to cope with its consequences. Selection of indicators for adaptive capacity is based on the DFID sustainable livelihoods framework, whereby adaptive capacity is taken to be a function of asset possession by the households (Jakobsen, 2011; Nelson, et al., 2010b).	
et al. 2013) (Piya, Maharjan, and Joshi	people have for managing these risks (Turner et al. 2003). (Notenbaert et al. 2013, 460) Adaptive capacity is the ability of a system to adjust to climate change including climate variability and extremes, to moderate the potential damage from it, to take advantage of its opportunities, or to cope with its consequences. Selection of indicators for adaptive capacity is based on the DFID sustainable livelihoods framework, whereby adaptive capacity is taken to be a function of asset possession by the households (Jakobsen, 2011; Nelson, et al., 2010b). (Piya, Maharjan, and Joshi 2012, 12)	
et al. 2013) (Piya, Maharjan, and Joshi	people have for managing these risks (Turner et al. 2003). (Notenbaert et al. 2013, 460) Adaptive capacity is the ability of a system to adjust to climate change including climate variability and extremes, to moderate the potential damage from it, to take advantage of its opportunities, or to cope with its consequences. Selection of indicators for adaptive capacity is based on the DFID sustainable livelihoods framework, whereby adaptive capacity is taken to be a function of asset possession by the households (Jakobsen, 2011; Nelson, et al., 2010b).	
et al. 2013) (Piya, Maharjan, and Joshi 2012)	people have for managing these risks (Turner et al. 2003). (Notenbaert et al. 2013, 460) Adaptive capacity is the ability of a system to adjust to climate change including climate variability and extremes, to moderate the potential damage from it, to take advantage of its opportunities, or to cope with its consequences. Selection of indicators for adaptive capacity is based on the DFID sustainable livelihoods framework, whereby adaptive capacity is taken to be a function of asset possession by the households (Jakobsen, 2011; Nelson, et al., 2010b). (Piya, Maharjan, and Joshi 2012, 12)	
et al. 2013) (Piya, Maharjan, and Joshi 2012) (Sietz,	people have for managing these risks (Turner et al. 2003). (Notenbaert et al. 2013, 460) Adaptive capacity is the ability of a system to adjust to climate change including climate variability and extremes, to moderate the potential damage from it, to take advantage of its opportunities, or to cope with its consequences. Selection of indicators for adaptive capacity is based on the DFID sustainable livelihoods framework, whereby adaptive capacity is taken to be a function of asset possession by the households (Jakobsen, 2011; Nelson, et al., 2010b). (Piya, Maharjan, and Joshi 2012, 12) the adaptive capacity of smallholders	
et al. 2013) (Piya, Maharjan, and Joshi 2012) (Sietz, Choque, and	people have for managing these risks (Turner et al. 2003). (Notenbaert et al. 2013, 460) Adaptive capacity is the ability of a system to adjust to climate change including climate variability and extremes, to moderate the potential damage from it, to take advantage of its opportunities, or to cope with its consequences. Selection of indicators for adaptive capacity is based on the DFID sustainable livelihoods framework, whereby adaptive capacity is taken to be a function of asset possession by the households (Jakobsen, 2011; Nelson, et al., 2010b). (Piya, Maharjan, and Joshi 2012, 12) the adaptive capacity of smallholders (the term as used in this study	

		1 1	1	1
		explore alternative livelihood		
		opportunities.		
	·_	(Sietz, Choque, and Lüdeke 2012, 490)		
	(Tesso,	According to Füssel and Klein, the risk-		
	Emana, and	hazard framework (biophysical		
	Ketema	approach) corresponds most closely to		
	2012)	sensitivity in the IPCC ter- minology		
		while the adaptive capacity (broader		
		social development) is largely		
		consistent with the socioeco- nomic		
		approach [18].		
		[]		
		In the framework, capacity is generated		
		from the implementation of adaptation		
		and mitigation intervene- tions [18].		
A da a tina a ca	/Falix at al	(Tesso, Emana, and Ketema 2012, 873)	Default	Default
Adaptiveness	(Eakin et al.	Conceptually, the process of household adaptation could	Default	Default
	2012)	be considered a function of the current		
		state of the household (entitlements,		
		assets, activities) and the biophysical,		
		politi- cal, economic, institutional		
		contexts in which decisions are made		
		(determining the choice set for any		
		household); the exposure and		
		sensitivity of a household to stress and		
		change; the decisions taken; and the		
		outcome of those decisions. Adaptation		
		is a decision process designed to		
		"maintain capacities to deal with future		
		change" and thus can involve actions		
		that enhance adaptive capacities		
		(Nelson et al. 2007). A household's		
		experience of an environmental shock		
		or change—how it copes with the		
		event—may result in a rel- atively		
		dramatic change in livelihood activities		
		with poten- tially negative welfare		
		outcomes (e.g., increased poverty) or,		
		alternatively, may provide		
		opportunities for learning and welfare		
		improvements and thus enhanced		
		adaptive capaci- ties (McSweeney and		
		Coomes 2011)		
		(Eakin et al. 2012, 477)		
Agency	(Berkes and Ross 2013)	Not defined	Default	Default
Asset vulnerability	(Dasgupta	Using Moser's (1998) asset vulnerability	Default	Default
	and Baschieri	framework as guidance, we selected a		
	2010)	range of variables to create an index of		
		household vulnerability from GLSS 4.		
		Each variable captures an aspect of		
		vulnerability.		

		(Dasgupta and Baschieri 2010, 807)		
biophyisical conditions	(Westerhoff and Smit 2009)	Not defined	Default	Default
Climate and non- climate shocks	(Deressa, Hassan, and Ringler 2009)	Not defined	Default	Default
climate change	(Mengistu 2011)	Not defined	Default	Default
climate change and variability	(Mubaya et al. 2012)	In this paper, the distinction between 'climate variability' and 'climate change' relates to differences in time-scale. On the one hand, 'climate variability' is conceptualised as variations in the climate system over short time scales such as months, years or decades and on the other hand 'climate change' is conceptualised as longer term trends in mean climate variables of periods of decades or longer. This is the suggested distinction in definitions of the concepts in question by the IPCC (2001). (Mubaya et al. 2012, 10)	Default	Default
climatic risk factors	(Gandure, Walker, and Botha 2013)	Not defined	Default	Default
cluster pattern analysis	(Sietz, Choque, and Lüdeke 2012)	Without such a pre-selection, alternative approaches investigate the structure of the data space spanned by selected vulnerability indicators using cluster analysis. They deliver useful insights into recurrent indicator com- binations based on similarities among units of analysis, in cases where such a grouping exists. For example, clustering revealed typical livelihood strategies employed by small- holders in Mexico and Botswana (Eakin 2005; Sallu et al. 2010). (Sietz, Choque, and Lüdeke 2012, 492)	Default	Default
communities at risk of climate shocks	(Dasgupta and Baschieri 2010)	NOT DEFINED	Default	Default
community level	(Échevin 2011) (Günther and Harttgen 2009)	an extension of this empirical framework will consist in using two- level (i.e. household and community levels) modelling of the impact of those shocks following Günther and Harttgen (2009)'s approach. (Échevin 2011, 3) Multilevel models are designed to analyze the relationship between variables that are measured at different	NO CHANGE	(Günther and Harttgen 2009)

			1	
		hierarchical levels (for an introduction		
		see, e.g., Bryk & Raudenbush, 1992;		
		Goldstein, 1999; Hox, 2002). We speak of "hierarchical" or "multilevel" data		
		structure whenever variables are		
		collected at different hierarchical levels		
		with lower-levels (e.g., house-holds)		
		nested within higher-levels (e.g.,		
		communities).		
Community	(Berkes and	(Günther and Harttgen 2009, 1225)	Default	Default
Resilience	Ross 2013)	Community resilience as a function of the strengths or characteristics that	Delault	Derault
Resilience	RUSS 2015)	have been identified as important,		
		leading to agency and self-organization.		
		(Berkes and Ross 2013) 14 (Berkes and		
		Ross 2013, 14)	Defeult	Default
coping capacity	(Khan and	NOT DEFINED	Default	Default
	Salman 2012)			
coping strategies	(Mengistu	Not defined	Default	Default
· · · ·	2011)			
covariate shocks	(Échevin	NOT DEFINED	NO CHANGE	(Günther and
	2011)		-	Harttgen
	(Günther and	Households in developing countries are		2009)
	Harttgen	frequently hit by se-		
	2009)	vere idiosyncratic and covariate shocks		
		resulting in high income volatility. 1		
		(Günther and Harttgen 2009, 1222)		
		[]		
		1. Here, and in the following,		
		idiosyncratic shocks refer to household-		
		specific shocks (e.g., injury, birth, death,		
		or job loss of a household member) that		
		are only weakly correlated across		
		households within a community.		
		Covariate shocks refer to shocks that		
		are correlated across households within		
		communities but only weakly		
		correlated across communities (e.g.,		
		natural disasters or epidemics).		
	(5.1)	(Günther and Harttgen 2009, 1231)		
cross-scalar	(Eakin,	"teleconnections", a term used in	Default	Default
teleconnection	Winkels, and	climatology in relation to "any		
	Sendzimir	transmission of a coherent effect		
	2009)	beyond the location where the forcing		
		occurred" (Chase et al., 2005). For		
		example, one of the teleconnections		
		associated with the El Nin		
		~ o-Southern Oscillation effect is severe		
		drought		
		in Northeastern Brazil. Teleconnections		
		are also associated with other climate		
		phenomena such as the North Atlantic		

			1	
		Oscillation. The label of		
		"teleconnection" is not explanatory in		
		and of itself, but rather signifies the		
		existence of a correlation in events, and		
		highlights the need to explore the		
		connecting mechanisms and drivers in		
		order to anticipate outcomes.		
		(Eakin, Winkels, and Sendzimir 2009,		
		400)		
current adaptive	(Ford and	Adaptive capacity refers to a	Default	Default
capacity	Smit 2004)	community's potential or ability to		
		address, plan for, or adapt to exposure		
		(Smit and Pilifosova, 2003). Most		
		communities can cope with normal		
		climatic conditions and a range of		
		deviations around norms. People have		
		learned to modify their behaviour and		
		their environment to manage and take		
		advantage of their local climatic		
		conditions (Jones and Boer, 2003). This		
		ability to cope is referred to in the		
		literature as the "coping range"; it		
		reflects resource use options and risk		
		management strategies to prepare for,		
		avoid or moderate, and recover from		
		exposure effects (Hewitt and Burton,		
		1971; Smit et al., 1999; Jones, 2001;		
		Smit and Pilifosova, 2003). Adaptive		
		capacity relates to communities'		
		resilience, resistance, flexibility, and ro-		
		bustness (Smithers and Smit, 1997). It is		
		influenced by economic wealth, social		
		networks, infrastructure, social in-		
		stitutions, social capital, experience		
		with previous risk, the range of		
		technological adaptation available, and		
		equity of access to resources within the		
		community, as well as by other stresses		
		that contribute to the environment in		
		which decisions are made (Adger and		
		Kelly, 1999; Smit and Pilifosova, 2001;		
		Smith et al., 2003).		
		(Ford and Smit 2004, 393)		
Current exposure	(Ford and	Exposure is a property of a community	Default	Default
current exposure	Smit 2004)	relative to climatic conditions. It reflects	Sciuuit	
	5 20047	both the nature of the climatic		
		conditions and nature of the		
		community itself. Some communities		
		may be exposed to a particular climate		
		event whereas the same event may not		
		affect another community. Climatic		
		characteristics include magnitude,		
		-		
		frequency, spatial dispersion, duration,		1

			1	
		speed of onset, and temporal spacing of climatic risks, relating to tem- peratures, precipitation, and wind. The nature of the com- munity concerns its location relative to the climatic risks (Ford and Smit 2004, 393)		
current poverty status	(Chhihn and Poch 2012)	This study adopts the approach to measuring household economic vulnerability posited and elaborated in Chaudhuri's (2003) study of household vulnerability (Chhihn and Poch 2012, 30)	Default	Default
Current vulnerability	(Ford and Smit 2004)	The assessment of current vulnerability requires analyzing and documenting communities' experiences with climatic risks (current exposure) and the adaptive options and resource management strategies employed to address these risks (current adaptive capacity). (Ford and Smit 2004, 395)	Default	Default
damage potential	(Khan and Salman 2012)	Not defined	Default	Default
Determinants of Poverty & Vulnerability	(Échevin 2011)	Not defined	Default	Default
Determinants of resilience	(Tesso, Emana, and Ketema 2012)	important determinants for resilience at household level in North Shewa zone of Ethiopia. (Tesso, Emana, and Ketema 2012)(Tesso, Emana, and Ketema 2012, 872)	Default	Default
Direct drivers	(Misselhorn 2005)	NOT DEFINED	Default	Default
Disaster	(Eakin et al. 2012)	NOT DEFINED	Default	Default
dynamic natural resource base	(Sallu, Twyman, and Stringer 2010)	NOT DEFINED	Default	Default
Entity	(Ionesco et al. 2009)	The mainstream mathematical interpretation of an entity is that of a dynamical system in a given state. This is the interpretation we will adopt here (lonesco et al. 2009, 4)	Default	Default
environmental shocks	(Chhihn and Poch 2012)	This study adopts the approach to measuring household economic vulnerability posited and elaborated in Chaudhuri's (2003) study of household vulnerability (Chhihn and Poch 2012, 30)	Default	Default
exogenous drivers	(Eakin,	exogenous drivers (i.e. the risk and	Default	Default

	Winkels, and Sendzimir 2009)	stress factors) (Eakin, Winkels, and Sendzimir 2009, 399)		
Expected food insecurity	(Mutsvangwa 2011)	Among other things, the vulnerability status of smallholder farmers in different locations will be influenced by the household's ability to produce enough to ensure the household's food security. (Mutsvangwa 2011) (Mutsvangwa 2011, 21)	Default	Default
Expected future food- security status	(Capaldo et al. 2010)	conceptual framework drawn from it by Løvendal and Knowles (2005). (Capaldo et al. 2010, 7)	Default	Default
Expected poverty	(Deressa, Hassan, and Ringler 2009)	This method is based on estimating the probability that a given shock or set of shocks will move household consumption below a given minimum level (such as a consumption poverty line) or force the consumption level to stay below the minimum if it is already below this level (Chaudhuri et al. 2002). (Deressa, Hassan, and Ringler 2009, 3)	Default	Default
Experience of long term climate change	(Gandure, Walker, and Botha 2013)	The study relied on the experience and knowledge of farmers and community members in Gladstone to characterise their livelihood risks fromclimatic and non- climatic risk factors. (Gandure, Walker, and Botha 2013, 41)	Default	Default
exposed and sensitive to climate change	(Westerhoff and Smit 2009)	People's exposures and sensitivities to external conditions are influenced by their occupancy and livelihood characteristics, and the nature and degree to which these are affected by the external stresses. (Westerhoff and Smit 2009, 321)	Default	Default
Exposure	(Antwi-Agyei et al. 2013)	Exposure relates to the extent to which a particular system may be exposed to climatic stresses or variations (IPCC 2007). (Antwi-Agyei et al. 2013, 905)	NO CHANGE	(Füssel and Klein 2006)
	(Baca et al. 2014)	Exposure is the nature and extent of changes that a place's climate is subjected to with regard to variables such as temperature, precipitation, and extreme weather events. (Baca et al. 2014, 2)		
	(Füssel and Klein 2006)	Exposure: The nature and degree to which a system is exposed to significant climatic variations.		

	The exposure of a system to climate
	stimuli depends on the level of global
	cli- mate change and, due to the spatial
	heterogeneity of anthropogenic climate
	change, on the system's location
	(Füssel and Klein 2006, 313)
(Hahn,	Exposure in this case is the magnitude
Riederer,	
Foster 200	
	in precipitation,
	(Hahn, Riederer, and Foster 2009, 75)
(Jamir et a	
2013)	framework, vulnerability
2013)	is understood as a function of three
	components—exposure, sensitivity and
	adaptive capacity. Vulnerability is
	defined as "the degree to which a
	system is susceptible to or unable to
	cope with, adverse effects of climate
	change, including cli- mate variability
	and extremes" (IPCC 2001).
	(Jamir et al. 2013, 154)
(Luers et a	
2003)	are exposed to
	varying magnitudes and frequencies of
	disturbing forces, often resulting in
	differential vulnerabilities (IPCC, 2001;
	Turner et al., 2003a, b). We capture
	these differences in exposure
	bycalculating the expected value of the
	ratio of sensitivity to the state relative
	to a threshold based on the
	frequencydistribution of the stressors
	of concern:
	(Luers et al. 2003, 258)
(Notenbae	
et al. 2013	
	livelihoods, (Turner et al. 2003).
	(Notenbaert et al. 2013, 460)
(Piya,	Exposure is the nature and degree to
Maharjan,	which a system is exposed to significant
and Joshi	climatic variations.
2012)	(Piya, Maharjan, and Joshi 2012, 11)
(Sietz,	expo- sure, sensitivity and
Choque, a	
Lüdeke 20	
(Tesso,	Furthermore, in the IPCC frame- work,
Emana, ar	
	whereas both sensitivity and adaptive
Ketema	interest better benefit interest and adaptive
Ketema 2012)	capacity have an internal dimen- sion,

		framework [13].		
		(Tesso, Emana, and Ketema 2012, 873)		
factors afecting vulnerability	(Nkondze, Masuku, and Manyatsi 2013)	Not defined	Default	Default
factors influencing resilience and vulnerability	(Sallu, Twyman, and Stringer 2010)	Through comparative research we provide a rich contextual narrative and use it to explore those factors that in isolation and combination push livelihoods along particular "trajectories" towards vulnerability or resilience. (Sallu, Twyman, and Stringer 2010, 2)	Default	Default
Farmer perceptions	(Mubaya et al. 2012)	there is an alternative approach which underscores how individuals perceive their environment and make decisions, with mal-adaptations attributed to problems in perception, cognition or the lack of available information (Diggs, 1991; Saarinen, 1966; Taylor et al., 1988). The main point is that from whatever level these adapta- tion measures are taken, the adaptation and coping measures depend on households' perceptions of extreme events and the problems associated with them (Davies, 1993). (Mubaya et al. 2012, 10)	Default	Default
food insecurity	(Misselhorn 2005) (Mutsvangwa 2011)	Food insecurityin the communities described bythe case studies maybe conceptualized as one element in an entrenched and escalating cycle of vulnerability (Fig. 3). (Misselhorn 2005, 38) NOT DEFINED	NO CHANGE	(Misselhorn 2005)
food security	(Sietz, Choque, and Lüdeke 2012)	Food security is often discussed in terms of four dimensions: food availability, access, stability of supply/ access and utilisation (FAO 2000). (Sietz, Choque, and Lüdeke 2012, 490)	Default	Default
future exposure	(Ford and Smit 2004)	Future exposure also includes estimating the future state of the socioeco- nomic conditions, given that exposure is a property of the system relative to risk. (Ford and Smit 2004, 396)	Default	Default
future nutricional status	(Capaldo et al. 2010)	conceptual framework drawn from it by Løvendal and Knowles (2005). (Capaldo et al. 2010, 7)	Default	Default

Future vulnerability	(Ford and Smit 2004)	Future vulnerability is assessed by analyzing how cli- mate change will alter the nature of the climate-related risks and whether the communities' coping strategies will have the capacity to deal with these risks. Assessing future exposure involves collaboration with the climate science community to estimate the likelihood of changes in cli- matic attributes identified by the community (Ford and Smit 2004, 396)	Default	Default
Health	(Hahn, Riederer, and Foster 2009)	Proximity to health facility; 2 weeks illness; malaria-exposure-prevention (Hahn, Riederer, and Foster 2009, 77)	Default	Default
household and community vulnerability	(Misselhorn 2005)	In general terms, vulner- abilityand social resilience have been similarlydefined as the abilityof a system or communityto resist or absorb adverse conditions. [] Vulnerable commu- nities, where people are unable to buffer themselves from hazards for a number of reasons, have a low ability to cope with short- term shocks (such as drought) and to mitigate chronic stressors, which in turn means that the negative impacts on livelihoods resulting from coping and survival strategies are veryhigh. (Misselhorn 2005, 38)	Default	Default
household choice	(Bogale, Taeb, and Endo 2006)	Not defined	Default	Default
household consumption	(Sarris and Karfakis 2010)	consumption falling below a poverty threshold (Christiaensen and Subbarao 2004, Chaudhuri, et. al. 2002) (Sarris and Karfakis 2010, 4)	Default	Default
Household consumption(income)	(Deressa, Hassan, and Ringler 2009)	Not defined	Default	Default
household level	(Échevin 2011) (Günther and Harttgen 2009)	an extension of this empirical framework will consist in using two- level (i.e. household and community levels) modelling of the impact of those shocks following Günther and Harttgen (2009)'s approach. (Échevin 2011, 3) Multilevel models are designed to analyze the relationship between variables that are measured at different	NO CHANGE	(Günther and Harttgen 2009)

	r			
		hierarchical levels (for an introduction see, e.g., Bryk & Raudenbush, 1992; Goldstein, 1999; Hox, 2002). We speak of "hierarchical" or "multilevel" data structure whenever variables are collected at different hierarchical levels		
		with lower-levels (e.g., house- holds) nested within higher-levels (e.g., communities).		
		(Günther and Harttgen 2009, 1225)		
household level resilience	(Tesso, Emana, and Ketema 2012)	According to DFID, resil- ience at community level is explained as the ability of countries, communities and households to manage change, by maintaining or transforming living standards in the face of shocks or stresses—such as earthquakes, drought or violent conflict—without compromising their long- term	Default	Default
		prospects [10]. Similarly, resilience is the ability of a social or ecological system to absorb disturbances while retaining the same basic structure and ways of functioning, the capacity for self-organization, and the capacity to adapt to stress and change. This is a meas- urement of community's		
		capacity to absorb external shocks. In the aftermath of occurrence of climate change induced shocks, how do farmer bounce back to normal livelihood is about the resilience level of farming com- munity. A resilient community is		
		able to respond to changes or stress in a positive way, and is able to main- tain its core functions as a community despite those stresses [11]. (Tesso, Emana, and Ketema 2012, 871, 872)		
household vulnerability as expected poverty	(Chhihn and Poch 2012)	Household vulnerability as ex- pected poverty is defined as the probability that households will move into poverty given certain environmental shocks, current poverty status and household characteristics of respondents. (Chhihn and Poch 2012, 30)	Default	Default
household vulnerability to climate change	(Dasgupta and Baschieri 2010) (Nkondze,	Using the GLSS 4, we applied the asset vulnerability framework developed by Moser (1996, 1998, 2007). We constructed an index of vulnerability to climate change, at the household level. (Dasgupta and Baschieri 2010, 807) NOT DEFINED	NO CHANGE	(Tesso, Emana, and Ketema 2012)

	Masuku, and Manyatsi 2013) (Tesso, Emana, and Ketema 2012)	Therefore, vulner- ability is the degree to which a system is susceptible or unable to cope with the adverse effects of climate change, including climate variability and extremes. In this regard, vulnerability is a function of the character, magnitude, and rate of climate variation to which a system is ex- posed, its sensitivity, and its adaptive capacity [4]. (Tesso, Emana, and Ketema 2012) (Tesso, Emana, and Ketema 2012, 871)		
Household vulnerability to poverty	(Échevin 2011) (Günther and Harttgen 2009)	we can define vulnerability to poverty as the probability of falling into poverty when one's consumption/income falls below a predefined poverty line. (Échevin 2011, 5) The suggested approach is an integration of multilevel analysis (e.g., Goldstein, 1999) into Chaudhuri's (2002) method to estimate vulnerabil- ity (Günther and Harttgen 2009, 1223)	NO CHANGE	(Échevin 2011)
idiosyncratic shocks	(Échevin 2011) (Günther and Harttgen 2009)	NOT DEFINED Households in developing countries are frequently hit by se- vere idiosyncratic and covariate shocks resulting in high income volatility. 1 (Günther and Harttgen 2009, 1222) [] 1. Here, and in the following, idiosyncratic shocks refer to household- specific shocks (e.g., injury, birth, death, or job loss of a household member) that are only weakly correlated across households within a community. Covariate shocks refer to shocks that are correlated across households within communities but only weakly correlated across communities (e.g., natural disasters or epidemics). (Günther and Harttgen 2009, 1231)	NO CHANGE	(Günther and Harttgen 2009)
Impacts & responses to Hurricane Stan by coffee farmers	(Eakin et al. 2012)	In this paper, we document household responses to a climatic shock, Stan, to gain insight into how natural resource- dependent communities move to secure their livelihoods following	Default	Default

Lack of decent housing	(Khan and Salman 2012)	significant loss, the implications of household responses for coffee farming as a "domain of attraction," as well as to highlight those aspects of household choices and perceptions that may be indicative of resilience at broader scales. (Eakin et al. 2012, 477) (3) Lack of decent housing: Lack of access to a proper housing facility, as measured by the weighted average of two variables, percentage of population having kacha (weighted 3/6) and semi- pacca (weighted 1/6) houses, is linked	Default	Default
		closely to vulnerability.iv		
Lack of decent standard of living	(Khan and Salman 2012)	(Khan and Salman 2012, 165) (4) Lack of decent standard of living: Lack of access to overall socioeconomic provisions is measured by the average of two variables: the percentage of the population without access to piped water and the percentage of population with- out access to electricity (Khan and Salman 2012, 165)	Default	Default
livelihood level issues	(Misselhorn	Not defined	Default	Default
	2005)			
livelihood risks	(Gandure, Walker, and Botha 2013)	Not defined	Default	Default
Livelihood strategies	(Hahn, Riederer, and Foster 2009) (Misselhorn 2005)	Household working elsewhere; agriculture dependent households; livlihood diversification (Hahn, Riederer, and Foster 2009, 77) A livelihood maybe described as the capability, assets and activites required for a means of living. People everywhere pursue a range of livelihood strategies in attempting to increase their income and asset base ('accumulation strategies'), spread or reduce risk (in- crease securitythrough 'adaptive strategies'), mitigate the impact of shocks ('coping strategies'), and at the extreme, ensure survival through 'survival strategies' (Devereux, 1999; Scoones, 2000). (Misselhorn 2005, 38)	NO CHANGE	(Misselhorn 2005)
livelihood trajectories	(Sallu, Twyman, and Stringer 2010)	Bagchi et al. (1998) use the term "livelihood trajectories" to describe and explain the direction and pattern of livelihoods of individuals or groups of	Default	Default

	1			,
		people (e.g., households). A livelihood		
		trajectory approach allows the		
		examination of an individual		
		household's "strategic behavior that is		
		embedded in a historical repertoire, in		
		social differentiation" (de Haan and		
		Zoomers 2005), and in perceptions of		
		risk. Such an approach is sensitive to life		
		histories (an individual's own "story" of		
		their changing livelihoods).		
		(Sallu, Twyman, and Stringer 2010, 2)		
Livelihood	(Hahn,	The LVI includes seven major	Livelihood	(Hahn,
vulnerability	Riederer, and	components: Socio-Demographic	vulnerability	Riederer, and
vanierability	Foster 2009)	Profile, Livelihood Strategies, Social	A: {(Hahn,	Foster 2009)
	105101 20057	Networks, Health, Food, Water, and	Riederer, and	105101 2005)
		Natural Disasters and Climate	Foster 2009)}	
		Variability	Livelihood	
	(Falin	(Hahn, Riederer, and Foster 2009, 76)	vulnerability	/Falin
	(Eakin,	By placing the household as the focus of	B: {(Eakin,	(Eakin,
	Winkels, and	analysis, livelihood approaches	Winkels, and	Winkels, and
	Sendzimir	highlight both the exogenous drivers	Sendzimir	Sendzimir
	2009)	(i.e. the risk and stress factors) and the	2009)}	2009)
		factors internal to the household (i.e.		
		ability to mitigate and cope with stress)		
		which together influence household		
		security and well-being (Chambers and		
		Conway, 1992; Ellis, 1998).		
		(Eakin, Winkels, and Sendzimir 2009,		
		399)		
local level	(Piya,	Following the definition of vulnerability	Default	Default
vulnerability	Maharjan,	given by IPCC (2001), vulnerability in		
	and Joshi	this		
	2012)	study is taken to be a function of		
	,	exposure, sensitivity, and adaptive		
		capacity.		
		(Piya, Maharjan, and Joshi 2012, 11)		
minimum	(Deressa,	a given minimum level (such as a	Default	Default
		-	Delault	Delault
consumption(income) level	Hassan, and Binglor 2000	consumption poverty line)		
	Ringler 2009)	(Deressa, Hassan, and Ringler 2009, 3)	Defeuit	Default
Natural disasters and	(Hahn,	Sub-constructs: flood, drought, cyclone	Default	Default
Climate variability	Riederer, and	events; no warning of disaster; injury or		
	Foster 2009)	death from disaster; maximum		
		temperature; minimum temperature;		
		average percipitatoin		
		(Hahn, Riederer, and Foster 2009, 79)		
nested and	(Eakin,	In this article we use the concept of	Default	Default
teleconnected	Winkels, and	"nested and tele-		
livelihood	Sendzimir	connected vulnerabilities" to illustrate		
vulnerability	2009)	how the vulnerabilities and responses		
		of farm households in distinct		
		geographic locations are linked through		
		cross-scalar processes, as well as		
			1	1

			r	· · · · · · · · · · · · · · · · · · ·
		"teleconnected" in space and time. In a nested system, profoundchanges inkeyvariablesthatoperatenormallyonly at one level, e.g., within a defined geographic region or admin- istrative domain, can have non-linear outcomes for processes operating at broader scales of analysis (Gunderson andHolling, 2001). (Eakin, Winkels, and Sendzimir 2009, 400)		
Nested system	(Eakin, Winkels, and Sendzimir 2009)	In a nested system, profoundchanges inkeyvariablesthatoperatenormallyonly at one level, e.g., within a defined geographic region or admin- istrative domain, can have non-linear outcomes for processes operating at broader scales of analysis (Gunderson andHolling, 2001). Local level processes can episodically influence larger scale phenomena, and such explosive "upward cascades" can be sources of surprise at distant locations. (Eakin, Winkels, and Sendzimir 2009, 400)	Default	Default
non-climatic stress	(Mubaya et al. 2012)	It is important to note though, that climate change amplifies already existing risks for farmers. This is the case as there are non- climatic risk factors such as economic instability, trade liberalisa- tion, conflicts and poor governance that may also be faced by farmers (Nyong and Niang-Diop, 2006). Other factors are impacts of diseases such as malaria and HIV and AIDS and lack of and limited access to climate and agricultural information (Gandure, 2005; Gandure and Marongwe, 2006). Africa is also characterised by institutional and legal frameworks that are, in some cases, insuffi- cient to deal with environmental degradation and disaster risks (Beg et al., 2002; Sokona and Denton, 2001). (Mubaya et al. 2012, 10)	Default	Default
non-climatic risk factors	(Gandure, Walker, and Botha 2013)	Not defined	Default	Default
Perception of Adida farmers	(Mengistu 2011)	Adaptation of people to different hazards vary from household to households and region to region based on existing support system to increase the resilience of affected individuals.	Default	Default

		·		
		The assessment was aimed to generate		
		primary information from the farming		
		communities of Adiha related to cli-		
		mate change. This report examined the		
		perception of Adiha farmers on the		
		trend of climate change and re-lated		
		anomalities, existing coping strategies		
		in place.		
		(Mengistu 2011, 139)		
perception of risk	(Marshall 2010)	NOT DEFINED	Default	Default
Population density	(Khan and	(1) Population density: Vulnerability to	Default	Default
	Salman 2012)	the effects of cli- mate change consists		
		of vulnerability to death, displacement,		
		trauma, and loss of assets and		
		livelihoods. This is measured by		
		population density.		
		(Khan and Salman 2012, 165)		
Poverty	(Chhihn and	Technically, the household vulnerability	Default	Default
	Poch 2012)	index is derived from the difference		
	,	between the ex-		
		pected log per capita income and the		
		minimum log per capita income		
		threshold, with households having per		
		capita incomes lower than the		
		minimum per capita income defined as		
		vulnerable (poor). The expected log per		
		capita income is estimated using the		
		three-step feasible generalised least		
		squares (FGLS) method.		
		(Chhihn and Poch 2012, 30)		
Poverty line	(Calvo and	Our aim is merely to make an ex-ante	Default	Default
	Dercon 2013)	statement on the vulnerability of the		Dendant
	20100112010)	individual to fall below a poverty norm		
		z,		
		(Calvo and Dercon 2013, 724)		
preference criteria	(Ionesco et	Preference criteria are used to ascertain	Default	Default
	al. 2009)	whether		
		or not a possible evolution of the entity		
		is "bad" or "good". In the examples we		
		have considered, we have seen that this		
		judgment is usually made by		
		comparison with a "normal" evolution,		
		or an evolution under a "zero input".		
		(Ionesco et al. 2009, 5)		
prepared for adverse	(Dasgupta	Not defined	Default	Default
consequences	and Baschieri			
·	2010)			
private property	(Bogale,	Not defined	Default	Default
	. –		1	
	Taeb, and			

Property rights	(Bogale,	Property rights can be defined as bthe	Default	Default
	Taeb, and	capacity to call upon the collective		
	Endo 2006)	stand behind one's claim to a benefit		
		stream (Bromley, 1991).Q Thus,		
		property rights involve a relationship		
		between the right holder, others, and		
		an institution to back up the claim		
		(Bogale, Taeb, and Endo 2006, 136)		
Property rights	(Bogale,	Property rights over land and other	Default	Default
regime	Taeb, and	natural resources are often broadly		
	Endo 2006)	classified as public, com- mon, and		
		private or blegal individualsQ such as		
		com- panies.		
		(Bogale, Taeb, and Endo 2006, 136)		
public property	(Bogale,	Not defined	Default	Default
	Taeb, and			
	Endo 2006)			
reference scenarios	(lonesco et	The examples provided also have this	Default	Default
	al. 2009)	"punctual" or "one-step" character.		
		However, in many applications, it is		
		more natural to consider an evolution		
		of the system to be a sequence of		
		states, and to consider scenarios and reference scenarios instead of punctual		
		inputs for the vulnerability assessment.		
		A scenario is just a sequence of inputs:		
		es = $[e1,$		
		e2,, en]. Corresponding to such a		
		sequence, the sys- tem will undergo n		
		transitions, xs =[x0, x1,, xn]		
		(Ionesco et al. 2009, 7)		
regional vulnerability	(Khan and	Therefore we define vulnerability as	Default	Default
0 ,	Salman 2012)	damage potential and coping capacity,		
		that is, damage potential + coping		
		capacity = regional vulnerability		
		(McCarthy et al. 2001; Mustafa 1998).		
		(Khan and Salman 2012, 164)		
Resilience	(Eakin et al.	A resilient system is one that maintains	NO CHANGE	(Eakin et al.
	2012)	continued integrity of fundamental		2012)
		social-ecological services and functions		
		under conditions of variability, surprise		
		and stress (Carpenter et al. 2001; Folke		
		et al. 2002). Learning, self- organization		
		and adaptiveness have been proposed		
		as core components of resilient		
		communities. In this interpretation,		
		adaptiveness refers to the ability of		
		communities to "col- lectively manage		
		the resilience of the system" (Walker et		
		al. 2004) or, in other words, to actively		
		manage how a system responds to		
		change. Resilience is often evaluated		
		with explicit reference to a desired		

	(Marshall	state or (in less nor- mative terms) a "domain of attraction" (Gallopin 2006). A given system can have multiple domains of attraction, shifting states once thresholds are crossed. Resilience research seeks to understand the conditions in which thresholds are surpassed and shifts in state occur and strives to relate those conditions to specific human inter- ventions that facilitate or inhibit such shifts in state (Walker and Meyers 2004). (Eakin et al. 2012, 477) Not defined		
resilience and vulnerability of rural livelihoods	2010) (Sallu, Twyman, and Stringer 2010)	Fraser et al.'s (2010) vulnerability framework (Sallu, Twyman, and Stringer 2010, 2)	Default	Default
Resilience of rural livelihoods	(Eakin et al. 2012)	In the next section, we briefly review the related con- cepts of resilience and vulnerability, focusing on an attri- bute central to the definition of both concepts: "adaptiveness" and "adaptive capacity.' (Eakin et al. 2012, 476)	Default	Default
resource dependency	(Marshall 2010)	NOT DEFINED	Default	Default
response outcomes	(Eakin, Winkels, and Sendzimir 2009)	outcomes of these responses in terms of individual or household welfare. (Eakin, Winkels, and Sendzimir 2009, 399)	Default	Default
risk of experiencing climate change shock	(Dasgupta and Baschieri 2010)	We use average annual rainfall data, which serves as a proxy for risk of climate-change-related shock. (Dasgupta and Baschieri 2010, 810)	Default	Default
risk-induced poverty	(Günther and Harttgen 2009)	Here, and in the following, idiosyncratic shocks refer to household- specific shocks (e.g., injury, birth, death, or job loss of a household member) that are only weakly correlated across households within a community. Covariate shocks refer to shocks that are correlated across households within communities but only weakly correlated across communities (e.g., natural disasters or epidemics). (Günther and Harttgen 2009, 1231)	Default	Default
Rural household vulnerability	(Sarris and Karfakis 2010)	Thus a household is said to be vulnerable to the outcome of a risk event, if it does not have sufficient	Default	Default

E of lorganising	(Dorlos st d	resources to adequately contend with the risk event. In other words, the extent to which a household is vulnerable to a risk event, namely the extent to which the household can become and/or remain poor or food deprived, depends on the size of the risk event and how effective the household is in managing the risk event. (Sarris and Karfakis 2010, 1) [] considers vulnerability as the probability of consumption falling below a poverty threshold (Christiaensen and Subbarao 2004, Chaudhuri, et. al. 2002), (Sarris and Karfakis 2010, 4)	Default	Default
Sefl-organising	(Berkes and Ross 2013)	Not defined	Default	Default
Sensitivity	Ross 2013) (Antwi-Agyei et al. 2013)	sensitivity determines the response of a given system to climate change and may be shaped by socioeconomic and ecological conditions of the system (IPCC 2007). (Antwi-Agyei et al. 2013, 905)	Sensitivity A: {(Baca et al. 2014); (Füssel and Klein 2006); (Notenbaert	Sensitivity A: (Füssel and Klein 2006)
	(Baca et al. 2014)	Sensitivity is a measure of how systems could be affected by the change in climate (e.g. how much crop yields change or how much human health might be affected). (Baca et al. 2014, 2)	et al. 2013); (Piya, Maharjan, and Joshi 2012); (Sietz, Choque, and	Sensitivity B: (Antwi-Agyei et al. 2013)
	(Füssel and Klein 2006)	Sensitivity: The degree to which a system is affected, either adversely or beneficially, by climate-related stimuli. [] The effect may be direct []or indirect [] [] The sensitivity of a system denotes the (generally multi-factorial and dynamic) dose – response relationship between its exposure to climatic stimuli and the re- sulting impacts. (Füssel and Klein 2006, 314)	Lüdeke 2012)} Sensitivity B: {(Antwi-Agyei et al. 2013)} Variance: {(Luers et al. 2003)}	
	(Hahn, Riederer, and Foster 2009) (Jamir et al. 2013)	sensitivity is the degree to which the system is affected by the exposure (Hahn, Riederer, and Foster 2009, 75) Asper theIPCC's definition and framework, vulnerability is understood as a function of three components—exposure, sensitivity and adaptive capacity. Vulnerability is defined as "the degree to which a	-	

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		to assist graziers to minimise losses in		
		drought years and take advantage of		
		favourable seasons (Hayman et al.,		
		2007; Salinger et al., 2005; Hansen,		
		2002; Eto, 2003; Moss, 2007).		
		(Marshall 2010, 37)		
Vulnerability	(Antwi-Agyei	Nevertheless, the most commonly	Vulnerability	Vulnerability
	et al. 2013)	accepted approach, which is the	A:	A: (Füssel and
		approach adopted in this paper, comes	{(Antwi-Agyei	Klein 2006)
		from the Intergovernmental Panel on	et al. 2013);	
		Climate Change (IPCC)'s definition of	(Eakin,	
		vulnerability (to climate change) where	Winkels, and	
		vulnerability is "the degree to which an	Sendzimir	
		environmental or social system is	2009); (Füssel	
		susceptible to, and unable to cope with,	and Klein	
		adverse effects of climate change,	2006);	
		including climate variability and	(Ionesco et	
		extremes''	al. 2009);	
		(Antwi-Agyei et al. 2013, 904)	(Jamir et al.	
	(Bogale,	Not defined	2013);	Vulnerability
	Taeb, and		(Mutsvangwa	B: (Calvo and
	Endo 2006)		2011);	Dercon 2013)
	(Calvo and	In this article, we explore the notion of	(Notenbaert	Vulnerability
	Dercon 2013)	vulnerability to poverty, closely linked	et al. 2013);	C: (Capaldo et
		with the magnitude of the threat of	(Sietz,	al. 2010)
		poverty, measured ex-ante, before	Choque, and	
		uncertainty has been resolved.	Lüdeke	
		[]	2012)}	
		To clarify how all these intuitions come	Vulnerability	
		together under the concept of	В:	
		vulnerability, this paper proposes an	{(Calvo and	
		axiomatic approach to	Dercon	
		themeasurement of both individual and	2013);	
		aggregate vulnerability.	(Deressa,	
		(Calvo and Dercon 2013, 722)	Hassan, and	
	(Capaldo et	conceptual framework drawn from it by	Ringler	
	al. 2010)	Løvendal and Knowles (2005).	2009)}	
	,	(Capaldo et al. 2010, 7)	Vulnerability	
			C: { (Capaldo	
	(Deressa,	Thus, vulnerability is seen as expected	et al. 2010) }	
	Hassan, and	poverty, while consumption (income) is	Variance:	
	Ringler 2009)	used as a proxy for well-being.	{(Bogale,	
	0	(Deressa, Hassan, and Ringler 2009, 3)	Taeb, and	
	(Eakin et al.	The concept of vulnerability is closely	Endo 2006)}	
	2012)	linked to that of		
	,	resilience; however, the concepts		
		emerged from different disciplinary		
		traditions and have distinct		
		applications, with implications for the		
		utility of these concepts for different		
		units of analysis (Eakin and Luers 2006;		
		Turner 2010). Vulnerability generally		

Г		1	
	refers to the propensity of some unit of		
	exposure to experience harm. In		
	practice, house- holds are often a		
	convenient unit of analysis for vulnera-		
	bility assessments that aim to		
	differentiate a population in terms of		
	sensitivity to a particular stressor and		
	capacities to effectively respond (Eakin		
	and Luers 2006). At the household		
	level, vulnerability is often evaluated by		
	assessing exposure (the physical		
	relation of the household to a stressor)		
	and sensitivities to the losses		
	experienced (e.g., what the impact		
	means for the household's function and		
	survival), as well as by the households'		
	ability to cope and adapt, or its		
	"adaptive capacity," prior to and after		
	experiencing loss.		
	(Eakin et al. 2012, 477)		
(Füssel and	Vulnerability: The degree to which a		
Klein 2006)	system is susceptible to, or unable to		
	cope with, adverse effects of climate		
	change, including climate variability and		
	extremes. Vulnerability is a function of		
	the character, magnitude, and rate of		
	climate variation to which a system is		
	exposed, its sensitivity, and its adaptive		
	capacity.		
	(Füssel and Klein 2006, 306)		
(lonesco et	Definition (Vulnerability with a		
al. 2009)	reference input) A system $f : X \times E \rightarrow X$		
ai. 2009)	in state x is vulnerable to e with respect		
	to the strict partial order \prec and the		
	reference input e* if		
	-		
	f(x, e) < f(x, e*)		
	[]		
	\prec and the reference scenario es* \in En		
	if $xs < xs*$		
	Definition (Vulnerability with a		
	reference scenario)A system f : $X \times E \rightarrow$		
	X in state x is vulnerable to input		
	scenario es \in En with respect to the		
	strict partial order		
	(8)		
	where xs and xs* are the trajectories		
	induced by the input scenario and		
	reference scenario, respectively.		
	(Ionesco et al. 2009, 6)		
(Jamir et al.	Asper the IPCC's definition and		
2013)	framework, vulnerability		
	is understood as a function of three		
	components—exposure, sensitivity and	1 1	

			1	
		adaptive capacity. Vulnerability is		
		defined as "the degree to which a		
		system is susceptible to or unable to		
		cope with, adverse effects of climate		
		change, including cli- mate variability		
		and extremes" (IPCC 2001).		
		(Jamir et al. 2013, 154)		
	(Mutsvangwa	vulnerability as a starting point which		
	2011)	focuses on the susceptibility of the		
		household2 (Füssel., 2007). This study		
		takes on the starting point		
		interpretation, which takes the root		
		problem as social vulnerability and		
		examines the current vulnerability of		
		the households as a measure of		
		vulnerability to climate change.		
		Households that are currently		
		vulnerable to food insecurity will find it		
		difficult to cope with adverse impacts of		
		changes in climatic conditions. Thus		
		measuring the likelihood of being food		
		insecure provides a way to examine		
		vulnerability to climate change.		
		(Mutsvangwa 2011, 2)		
		[]		
		Vulnerability refers to the manner and		
		degree to which a system is susceptible		
		to conditions that negatively affect the		
		well-being of the system. In the climate		
		change field, the IPCC Third Assessment		
		Report defines vulnerability as "the		
		degree to which a system is susceptible		
		to, or unable to cope with, adverse		
		effects of climate change, including		
		climate variability and extremes"		
		(McCarthy et al., 2001).		
		(Mutsvangwa 2011, 15)		
		[]		
		The differences between these two		
		interpretations of vulnerability are		
		summarized in Table 1.		
		Vulnerability according to the end point		
		interpretation represent the expected		
		net impacts of a given level of global		
		climate change, taking into account		
		feasible adaptations. Vulnerability		
		according to the starting point		
		interpretation focuses on reducing		
		internal socioeconomic vulnerability to		
		any climatic hazard. This study takes on		
		the starting point interpretation.		
	(Nista l	(Mutsvangwa 2011, 17)	4	
	(Notenbaert	For the purpose of this paper, we work		

				· · · · · · · · · · · · · · · · · · ·
	et al. 2013)	with the definition proposed by the		
		Working Group II of the IPCC in the		
		third assess- ment report. We will refer		
		to (1) exposure to climate change		
		impacts, (2) sensitivity to those impacts		
		and (3) the capacity to cope with those		
		impacts as the components of		
		vulnerability. Vulnerability is thus		
		comprised of risks (or a chain of risky		
		events) that people confront in pursuit		
		of their livelihoods, the sensitivity of		
		the livelihood to these risks, the risk		
		response or the options that people		
		have for managing these risks and		
		finally the outcomes that describe the		
		loss in well-being (Turner et al. 2003).		
		(Notenbaert et al. 2013, 460)		
	(Sietz,	Climate vulnerability is considered as a	1	
	Choque, and	function of expo- sure, sensitivity and		
	Lüdeke 2012)	coping/adaptive capacity (IPCC 2007).		
	Ludeke 2012)	(Sietz, Choque, and Lüdeke 2012, 490)		
Vulnerability as	(Luers et al.	we derive a generic vulnerabilitymetric	Default	
suceptability	2003)	bytranslating a general definition of	Delaute	
suceptability	2003)	vulnerability, the susceptibilityto		
		damage, into a mathematical expres-		
		sion. To do this we first define a		
		threshold of damage and then measure		
		susceptibility in terms of the system's		
		sensitivity to and exposure to		
		stressors.We then propose a		
		framework for estimating a system's		
		ability to modify its vulnerable		
		conditions byadapting and responding		
		to changing circumstances.		
		(Luers et al. 2003, 257)		
Vulnerability ipcc	(Hahn,	Many of these rely heavily on the IPCC	Default	
	Riederer, and	working definition of vulnerability as a		
	Foster 2009)	function of exposure, sensitivity, and		
		adaptive capacity (IPCC, 2001).		
		(Hahn, Riederer, and Foster 2009, 75)		
Vulnerability of	(Baca et al.	For our methodology, vulnerability is	Default	
coffee farming	2014)	defined as changes in climate variables		
communities		that affect agricultural and natural		
		systems over a timeframe. The		
		vulnerability in the livelihoods of small		
		coffee farmers is a function of three		
		factors: exposure, sensitivity and		
		adaptive capacity.		
		(Baca et al. 2014, 2, 3)		
vulnerability to	(CARE 2009)	The degree to which a system is	Default	
climate change	,,	susceptible to, or unable to cope with,	-	
- 0-		adverse effects of climate change,		
		including climate variability and		
			1	1

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		produce for household food security, thus what the households produce is equated to consumptions levels for the household, in this study. (Mutsvangwa 2011) (Mutsvangwa 2011, 21)		
Welfare of rural housholds	(Dasgupta and Baschieri 2010)	Not defined	Default	

Appendix G: Construct mergers made in Step 2.13

Name of emic	Bridging node		
construct	Representative definition		
adaptation strategy	Adaptations, or adaptive strategies, employed by individuals or groups are depicted as being mediated through their relative adaptive capacities, indicating that adaptations may or may not be accessed according to the distribution of various types of resources such as physical or social capital, as developed by Adger and Kelly (1999). (Westerhoff and Smit 2009, 321)	Merged - [adaptation strategy]; [Impacts & responses to Hurricane Stan by coffee farmers]	
Impacts & responses to Hurricane Stan by coffee farmers	In this paper, we document household responses to a climatic shock, Stan, to gain insight into how natural resource- dependent communities move to secure their livelihoods following significant loss, the implications of household responses for coffee farming as a "domain of attraction," as well as to highlight those aspects of household choices and perceptions that may be indicative of resilience at broader scales. (Eakin et al. 2012, 477)		
adaptation to long term climate change	Unique in our study, is the use of individual perceptions in identifying and understanding the processes of adaptation in an area that has undergone significant political and socio-economic reformation resulting from a series of conflicts over land resources. (Gandure, Walker, and Botha 2013, 40)	Merged - [adaptation to long term climate change]; [Farmer perceptions]	
Farmer perceptions	 there is an alternative approach which underscores how individuals perceive their environment and make decisions, with mal-adaptations attributed to problems in perception, cognition or the lack of available information (Diggs, 1991; Saarinen, 1966; Taylor et al., 1988). The main point is that from whatever level these adapta- tion measures are taken, the adaptation and coping measures depend on households' perceptions of extreme events and the problems associated with them (Davies, 1993). (Mubaya et al. 2012, 10) 		
Current exposure	Exposure is a property of a community relative to climatic conditions. It reflects both the nature of the climatic conditions and nature of the community itself. Some communities may be exposed to a particular climate event whereas the same event may not affect another community. Climatic characteristics include magnitude, frequency, spatial dispersion, duration, speed of onset, and temporal spacing of climatic risks, relating to tem- peratures, precipitation, and wind. The nature of the com- munity concerns its location relative to the climatic risks (Ford and Smit 2004, 393)	Merged - [Current exposure]; [exposure]	

erty]; as sehold [rural ability
as sehold [rural
ehold [rural
[rural
;
ability

	preempt any confusion with vulnerability to downfalls	
	in wellbeing. Our reference point is an absolute poverty	
	norm (e.g. as in Chaudhuri 2003; Suryahadi and	
	Sumarto 2003, or Christiaensen and Subbarao 2005),	
	and not the initial individual position.	
	(Calvo and Dercon 2013, 723)	
future exposure	Future exposure also includes estimating the future	Merged - [future exposure];
	state of the socioeco- nomic conditions, given that	[risk of experiencing climate
	exposure is a property of the system relative to risk.	change shock]
	(Ford and Smit 2004, 396)	
risk of experiencing	We use average annual rainfall data, which serves as a	
climate change shock	proxy for risk of climate-change-related shock.	
	(Dasgupta and Baschieri 2010, 810)	
household	consumption falling below a poverty threshold	Merged - [household
consumption	(Christiaensen and Subbarao 2004, Chaudhuri, et. al.	consumption]; [minimum
•	2002)	consumption(income) level];
	(Sarris and Karfakis 2010, 4)	[poverty]; [poverty line];
minimum	a given minimum level (such as a consumption poverty	[welfare indicator]
consumption(income)	line)	
level	(Deressa, Hassan, and Ringler 2009, 3)	
Poverty	Technically, the household vulnerability index is derived	
/	from the difference between the ex-	
	pected log per capita income and the minimum log per	
	capita income threshold, with households having per	
	capita incomes lower than the minimum per capita	
	income defined as vulnerable (poor). The expected log	
	per capita income is estimated using the three-step	
	feasible generalised least squares (FGLS) method.	
	(Chhihn and Poch 2012, 30)	
poverty line	(Chhihn and Poch 2012, 30) Our aim is merely to make an ex-ante statement on the	
poverty line	Our aim is merely to make an ex-ante statement on the	
poverty line	Our aim is merely to make an ex-ante statement on the vulnerability of the individual to fall below a poverty	
poverty line	Our aim is merely to make an ex-ante statement on the vulnerability of the individual to fall below a poverty norm z,	
poverty line	Our aim is merely to make an ex-ante statement on the vulnerability of the individual to fall below a poverty	
	Our aim is merely to make an ex-ante statement on the vulnerability of the individual to fall below a poverty norm z, (Calvo and Dercon 2013, 724)	
	Our aim is merely to make an ex-ante statement on the vulnerability of the individual to fall below a poverty norm z, (Calvo and Dercon 2013, 724) This study uses the household's cereal production	
	Our aim is merely to make an ex-ante statement on the vulnerability of the individual to fall below a poverty norm z, (Calvo and Dercon 2013, 724) This study uses the household's cereal production levels as a measure of welfare. Farmers in both Gweru	
	Our aim is merely to make an ex-ante statement on the vulnerability of the individual to fall below a poverty norm z, (Calvo and Dercon 2013, 724) This study uses the household's cereal production levels as a measure of welfare. Farmers in both Gweru and Lupane mainly depend on what they produce for	
	Our aim is merely to make an ex-ante statement on the vulnerability of the individual to fall below a poverty norm z, (Calvo and Dercon 2013, 724) This study uses the household's cereal production levels as a measure of welfare. Farmers in both Gweru and Lupane mainly depend on what they produce for household food security, thus what the	
	Our aim is merely to make an ex-ante statement on the vulnerability of the individual to fall below a poverty norm z, (Calvo and Dercon 2013, 724) This study uses the household's cereal production levels as a measure of welfare. Farmers in both Gweru and Lupane mainly depend on what they produce for household food security, thus what the households produce is equated to consumptions levels	
	Our aim is merely to make an ex-ante statement on the vulnerability of the individual to fall below a poverty norm z, (Calvo and Dercon 2013, 724) This study uses the household's cereal production levels as a measure of welfare. Farmers in both Gweru and Lupane mainly depend on what they produce for household food security, thus what the households produce is equated to consumptions levels for the household, in this study.	
welfare indicator	Our aim is merely to make an ex-ante statement on the vulnerability of the individual to fall below a poverty norm z, (Calvo and Dercon 2013, 724) This study uses the household's cereal production levels as a measure of welfare. Farmers in both Gweru and Lupane mainly depend on what they produce for household food security, thus what the households produce is equated to consumptions levels for the household, in this study. (Mutsvangwa 2011) (Mutsvangwa 2011, 21)	Merged - [Household
welfare indicator Household	Our aim is merely to make an ex-ante statement on the vulnerability of the individual to fall below a poverty norm z, (Calvo and Dercon 2013, 724) This study uses the household's cereal production levels as a measure of welfare. Farmers in both Gweru and Lupane mainly depend on what they produce for household food security, thus what the households produce is equated to consumptions levels for the household, in this study. (Mutsvangwa 2011) (Mutsvangwa 2011, 21) Therefore, vulner- ability is the degree to which a	Merged - [Household vulnerability to climate
welfare indicator Household vulnerability to	Our aim is merely to make an ex-ante statement on the vulnerability of the individual to fall below a poverty norm z, (Calvo and Dercon 2013, 724) This study uses the household's cereal production levels as a measure of welfare. Farmers in both Gweru and Lupane mainly depend on what they produce for household food security, thus what the households produce is equated to consumptions levels for the household, in this study. (Mutsvangwa 2011) (Mutsvangwa 2011, 21) Therefore, vulner- ability is the degree to which a system is susceptible or unable to cope with the	vulnerability to climate
welfare indicator Household	Our aim is merely to make an ex-ante statement on the vulnerability of the individual to fall below a poverty norm z, (Calvo and Dercon 2013, 724) This study uses the household's cereal production levels as a measure of welfare. Farmers in both Gweru and Lupane mainly depend on what they produce for household food security, thus what the households produce is equated to consumptions levels for the household, in this study. (Mutsvangwa 2011) (Mutsvangwa 2011, 21) Therefore, vulner- ability is the degree to which a system is susceptible or unable to cope with the adverse effects of climate change, including climate	vulnerability to climate change]; [local level
welfare indicator Household vulnerability to	Our aim is merely to make an ex-ante statement on the vulnerability of the individual to fall below a poverty norm z, (Calvo and Dercon 2013, 724) This study uses the household's cereal production levels as a measure of welfare. Farmers in both Gweru and Lupane mainly depend on what they produce for household food security, thus what the households produce is equated to consumptions levels for the household, in this study. (Mutsvangwa 2011) (Mutsvangwa 2011, 21) Therefore, vulner- ability is the degree to which a system is susceptible or unable to cope with the adverse effects of climate change, including climate variability and extremes. In this regard, vulnerability is a	vulnerability to climate change]; [local level vulnerability]; [vulnreability A];
welfare indicator Household vulnerability to	Our aim is merely to make an ex-ante statement on the vulnerability of the individual to fall below a poverty norm z, (Calvo and Dercon 2013, 724) This study uses the household's cereal production levels as a measure of welfare. Farmers in both Gweru and Lupane mainly depend on what they produce for household food security, thus what the households produce is equated to consumptions levels for the household, in this study. (Mutsvangwa 2011) (Mutsvangwa 2011, 21) Therefore, vulner- ability is the degree to which a system is susceptible or unable to cope with the adverse effects of climate change, including climate variability and extremes. In this regard, vulnerability is a function of the character, magnitude, and rate of	vulnerability to climate change]; [local level vulnerability]; [vulnreability A]; [vulnerability as suceptability];
welfare indicator Household vulnerability to	Our aim is merely to make an ex-ante statement on the vulnerability of the individual to fall below a poverty norm z, (Calvo and Dercon 2013, 724) This study uses the household's cereal production levels as a measure of welfare. Farmers in both Gweru and Lupane mainly depend on what they produce for household food security, thus what the households produce is equated to consumptions levels for the household, in this study. (Mutsvangwa 2011) (Mutsvangwa 2011, 21) Therefore, vulner- ability is the degree to which a system is susceptible or unable to cope with the adverse effects of climate change, including climate variability and extremes. In this regard, vulnerability is a function of the character, magnitude, and rate of climate variation to which a system is ex- posed, its	vulnerability to climate change]; [local level vulnerability]; [vulnreability A]; [vulnerability as suceptability]; [vulnerability ipcc];
welfare indicator Household vulnerability to	Our aim is merely to make an ex-ante statement on the vulnerability of the individual to fall below a poverty norm z, (Calvo and Dercon 2013, 724) This study uses the household's cereal production levels as a measure of welfare. Farmers in both Gweru and Lupane mainly depend on what they produce for household food security, thus what the households produce is equated to consumptions levels for the household, in this study. (Mutsvangwa 2011) (Mutsvangwa 2011, 21) Therefore, vulner- ability is the degree to which a system is susceptible or unable to cope with the adverse effects of climate change, including climate variability and extremes. In this regard, vulnerability is a function of the character, magnitude, and rate of climate variation to which a system is ex- posed, its sensitivity, and its adaptive capacity [4].	vulnerability to climate change]; [local level vulnerability]; [vulnreability A]; [vulnerability as suceptability]; [vulnerability ipcc]; [vulnerability of coffee farming
welfare indicator Household vulnerability to	Our aim is merely to make an ex-ante statement on the vulnerability of the individual to fall below a poverty norm z, (Calvo and Dercon 2013, 724) This study uses the household's cereal production levels as a measure of welfare. Farmers in both Gweru and Lupane mainly depend on what they produce for household food security, thus what the households produce is equated to consumptions levels for the household, in this study. (Mutsvangwa 2011) (Mutsvangwa 2011, 21) Therefore, vulner- ability is the degree to which a system is susceptible or unable to cope with the adverse effects of climate change, including climate variability and extremes. In this regard, vulnerability is a function of the character, magnitude, and rate of climate variation to which a system is ex- posed, its sensitivity, and its adaptive capacity [4]. (Tesso, Emana, and Ketema 2012) (Tesso, Emana, and	vulnerability to climate change]; [local level vulnerability]; [vulnreability A]; [vulnerability as suceptability]; [vulnerability ipcc]; [vulnerability of coffee farming communities]; [vulnerability to
Household vulnerability to	Our aim is merely to make an ex-ante statement on the vulnerability of the individual to fall below a poverty norm z, (Calvo and Dercon 2013, 724) This study uses the household's cereal production levels as a measure of welfare. Farmers in both Gweru and Lupane mainly depend on what they produce for household food security, thus what the households produce is equated to consumptions levels for the household, in this study. (Mutsvangwa 2011) (Mutsvangwa 2011, 21) Therefore, vulner- ability is the degree to which a system is susceptible or unable to cope with the adverse effects of climate change, including climate variability and extremes. In this regard, vulnerability is a function of the character, magnitude, and rate of climate variation to which a system is ex- posed, its sensitivity, and its adaptive capacity [4].	vulnerability to climate change]; [local level vulnerability]; [vulnreability A]; [vulnerability as suceptability];

Appendix H: Identification of framework-defining constructs (Step 2.14)

IPCC											
Baca et al	Luers et	Piya et a		Care	Fussel &		Hahn et	Jamir et a	al Notenbae	Antwi-	
(5)	al				Klein		al		rt et al	Agyei	
Vulnerabi	Vulnerabi	Vulnerat	oili	Vulnerabi	Vulnerat	oilit	Vulnerabi	Vulnerab	ili Vulnerabi	Vulnerab	
lity IPCC	lity IPCC	ty IPCC		lity IPCC	y IPCC		lity IPCC	ty IPCC	lity IPCC	lity IPCC	
Exposure	Exposure	Exposure	ē		Exposure	9	Exposure	Exposure	Exposure	Exposure	
(M)	(M)	(M)			(M)		(M)	(M)	(M)	(M)	
Sensitivit	Sensitivit	Sensitivi	ty		Sensitivi	ty A	Sensitivit	Sensitivit	y Sensitivit	Sensitivit	
у А	y (Var)	А					у А	А	у А	у В	
Adaptive	Adaptive	Adaptive		Adaptive	Adaptive	ć	Adaptive	Adaptive	Adaptive	Adaptive	
Capacity	Capacity	Capacity A Capacity Ca		Capacity	Α	Capacity	Capacity	A Capacity	Capacity		
А	А		A			А		А	А		
	ty as Expecte	ed Poverty									
Deressa et				rris & Karfak			Chhihn & Poc		Calvo & Dero		
					s Expected		Vulnerability		Vulnerability	as Expected	
	Poverty (M)						Expected Pov	erty (M)	Poverty (M)		
Poverty (M			Ро	verty (M)			Poverty (M)		Poverty (M)		
Climate an	d non-climate	e shocks									
	ty as Expecte	ed food sec	urity	L		-					
Mutsvangv							paldo et al				
	ty as Expecte	ed Poverty				Vu	Inerability (Va	ar)			
Poverty											
Food insec	urity										
							pected future		rity status		
						Fu	ture nutrition	al status			
	ty as Expecte	ed Poverty	– mı	ulti-level ana							
Günther &					Eche						
	ty as Expecte	ed Poverty					bility as Expec	ted Povert	У		
Idiosyncrat	ic shocks				Idios	Idiosyncratic shocks					
Covariate s						Covariate shocks					
Household						Household level					
Community	y level				Com	Community level					
	s of climate o										
Mubaya et		W	/este	erhoff & Smit	t N	/leng	gitsu		andure et al		
Farmer per		-						Fa	armer percepti	ons	
Climate cha	ange and	-									
variability											
Threat to li	velihoods	-									
	ic stress	-									
Non-climat											
Non-climat		A	dapt	ive strategy							

Community Resilience (Residual)
default
Choice of property rights regime (Residual)
default
Asset vulnerability (Residual)
default
Disaster resilience of rural livelihoods (Residual)
default
Nested Vulnerability (Residual)
default
Current and future vulnerability (Residual)
default
Livelihood vulnerability index (Residual)
default
Mathematical formalisation of vulnerability (Residual)
default
Regional vulnerability (Residual)
default
Social Resilience (Residual)
default
Intensifying vulnerability to food insecurity (Residual)
default
Nkondze et al (2013) (Residual)
default
Patterns of smallholder vulnerability (Residual)
default
Livelihood trajectories and resilience and vulnerability (Residual)
default
Determinants of Resilience (Residual)
default

Appendix I: Review of frameworks by team member with expertise in field

Framewo rk	Description	Main constructs	Articles	Recogn ise?	Distinct ?	Useful ?	Any comments
IPCC	This framework is guided by the definition and theory of the IPCC, which conceives of vulnerability to climate change as having three dimensions: Exposure to climate- induced shocks (a natural science phenomenon); the Sensitivity of the unit of analysis to such shocks (a social and natural science phenomenon); the adaptive capacity to deal with such shocks (a social science phenomenon). The framework often but not always creates a context-specific index of vulnerability from indicators of these three dimensions.	Vulnerability (IPCC); Exposure; Sensitivity (A,B); Adaptive Capacity (A)	Antwi- Agyei et al (2013); Baca et al (2004); CARE (2009); Fussel & Klein (2006); Hahn et al (2009); Jamir et al (2013); Luers et al (2013); Notenba ert et al (2013); Piya et al (2012).	Yes/no YES	Distinct/ to be merged	Retain / discard RETAIN	
Vulnerabi lity as Expected Poverty	This framework conceives of vulnerability as the potential of a unit of analysis (usually a household) becoming or remaining poor in the future. It is an econometric approach that makes forward projections based on cross- sectional data and associated risks of climatic (and sometimes non-climatic) stress. In some cases, assessments of vulnerability based on expected poverty are then regressed against	Vulnerability as Expected Poverty; Poverty	Calvo & Dercon (2012); Chhinh & Poch (2012); Deressa et al (2009);	YES	Merge the three highlighte d as variations on a theme.	RETAIN	

	a series of socio-economic data to identify determinants of vulnerability.		Sarris & Karfakis (2010)		
Vulnerabi lity as Expected food security	This is a variant of the framework 'Vulnerability as Expected Poverty' described above. The principal difference is that whereas the former takes its focus as that of current and projected future levels of <i>poverty</i> , usually measured through consumption, the current framework by contrast focusses on a household's current and projected future <i>food security</i> status.	Vulnerbaility as Expected Poverty; Poverty; Food insecurity; Expected future food security status; Future nutritional status	Capaldo et al (3020); Mutsvan gwa (2011)	YES	RETAIN
Vulnerabi lity as Expected Poverty – multi- level analysis	Another extension of the 'Vulnerability as Expected Poverty' framework described above. This variant is characterised by its inclusion of multi-level analysis. That is, projections are made for units of analysis at two different scales (usually household and community/local), and analysis is done of differences between units at different scales.	Vulnerability as Expected Poverty; Idiosyncratic shocks; Covariate shocks; Household level; Community level	Echevin (2011); Günther & Harttgen (2009)	YES	RETAIN
Perceptio ns of climate change	This category constitutes less a coherent framework and more of a collection of studies whose approach differs significantly from the majority of studies in this review in terms of epistemological orientation and position on the intervention cycle. A tentative general description of this category is that the approach focusses on articulating perceptions of people whose livelihoods are affected by climate change (often farmers), and in particular their perceptions of climate change as a physical phenomenon, perceptions of the impact climate change has on their livelihoods, and respondent reported strategies of coping or adaptation.	Farmer perceptions; Adaptation strategy; Coping strategy	Gandure et al (2013); Mengitsu (2011); Mubaya (2012); Westerh off & Smit (2009)	YES	RETAIN
Communi ty Resilienc	This framework focusses on a concept of 'resilience' which is built on similar concepts in the fields of psychology and in	Community resilience; Agency; Self organising;	Berkes & Ross (2013)	YES	

е	development studies. In particular it is a	Adaptive Capacity (B)					
(Residual)	framework which looks at instances where						
	communities display agency and self-						
	organisation as key aspects of resilience						
Choice of property rights regime (Residual)	This framework does not take vulnerability as its main focus. The focus instead is on household preferences for property rights regimes (as in, do they prefer private property, public property, or some form of common property), and looks in particular at the determinants, among them vulnerability, leading households to certain choices.	Property rights; Property rights regime; Household choice; Public property; Private property	Bogale et al (2006)	NO	No	No	Vulnerability not enough of a research focal point
Asset vulnerabi lity (Residual)	This framework conveives of household vulnerbility to climate change in terms of the management control that can be exercised over a series of assets. These assets include labour, human capital, non-labour productive assets, household relations, and social capital. A vulnerability index is created through a framework of weighted indicators representing each type of asset.	Household vulnerability to climate change; Asset vulnerability; Future exposure; Communities at risk of climate shocks; Welfare of rural households; Prepared for adverse consequences	Dasgupta & Baschieri (2010)	YES		Appears collapsable with the three vulnerability themed frameworks above	
Disaster resilience of rural livelihood s (Residual)	The focus here is on the adaptiveness of households in terms of their livelihoods and how such livelihoods are affected by disaster. The concept of adaptiveness is taken from the intersection between vulnerability frameworks and resilience frameworks. The framework is operationalised through a case study involving both quantitative (household survey) and qualitative (in-depth interviews) methods. Although the framework looks formally at resilience to <i>disaster</i> , it seems likely that the framework is transferable to other forms of climate-related extreme events.	Resilience of rural livelihoods; Resilience; Vulnerability IPCC; Disaster; Adaptation strategy; Adaptiveness;	Eakin et al (2012)	YES		Discard	Disasters vulnerability does not really provide clear indication of how to research long-term changes in CC vulnerability.
Nested	This framework is concerned with	Livelihood vulnerability	Eakin et	YES		Retain	

Vulnerabi	'teleconnections' between households in	(B);	al (2008)				
lity	geographically distant localities. It examines	Nested and	ui (2000)				
(Residual)	the mechanisms through which smallholders	teleconnected					
(Residual)	in distinct geographical contexts respond	livelihood vulnerability;					
	differently to exogenous shocks (climatic or	Nested system;					
	not-climatic) and in so doing create a new set	Cross scalar					
	of influences on distant locations through	teleconnections;					
	connections in a nested globally	Exogenous drivers;					
	interconnected system.	Response outcomes				D	
Current	The main characteristics of this framework is	Vulnerability to climate	Ford &	YES		Retain	
and	its comparison of current and future states of	risks;	Smit				
future	vulnerability. Vulnerability is conceived as	Current vulnerability;	(2004)				
vulnerabi	being composed of two principal elements:	Future vulnerability;					
lity	exposure to climatic changes, and adaptive	Current adaptive					
(Residual)	capacity. Multiple data sources are used to	capacity;					
	generate an assessment of current exposure	Exposure;					
	and current adaptive capacity. On the basis of	Future exposure					
	this data, and on historical social and physical						
	trends, projections are made as to likely						
	future states of exposure and future states of						
	adaptive capacity.						
Livelihoo	This framework consists of an index to	Livelihood vulnerability	Hahn et	YES		Retain	
d	measure levels of vulnerability. The index is	(A);	al (2009)				
vulnerabi	composed of a highly developed set of	Livelihood strategies;					
lity index	household-level indicators chosen to	Health;					
, (Residual)	represent seven dimensions of a particular	Socio-demographic					
(,	conception of 'livelihoods'. These seven	profile;					
	dimensions are: socio-demographic profile;	Water;					
	livelihood strategies; social network; health;	Natural disaster and					
	food; water; and natural disaster and climate	climate change					
	change.	chinate change					
Mathema	The contribution of this framework is that of	Vulnerability IPCC;	lonesco	YES	Merge	Yes	This sounds like
tical	mathematical formalisation of the concept of	Entity;	et al		with IPCC,		an elaboration
formalisa	vulnerability. In particular, the concept of	Stimulus;	(2009)		if this isn't		on IPCC, simply
tion of	vulnerability requires a specification of three	Preference criteria;	(2005)		fundamen		trying to design a
vulnerabi	elements: an entity that is vulnerable; a	Adaptive capacity (var)			tally at		concrete
lity	stimulus to which the entity is vulnerable; and	Reference scenarios			odds with		approach to
(Residual)		NEIEIEIILE SLEIIdHUS			it. Does it		
(nesiduai)	a preference criteria against which to			I	IL. DOES IL		measurement.

	normatively assess the outcomes of the entity affected by stimulus. The concept of adaptive capacity is also formalised. This framework is influenced by, although it does not closely resemble, the framework of the IPCC.				not resemble IPCC due to the formalizat ion?		
Regional vulnerabi lity (Residual)	The unit of analysis here is a spatial unit, or more precisely, administrative regions or districts that are conceived in geographical or spatial terms. A country-specific index is created with which to quantitatively compare vulnerability levels in different districts. Two interrelated concepts, damage potential and coping capacity, are deconstructed into 5 dimensions of human development: population density, knowledge level, housing standards, living standards, and importance of agriculture as a source of livelihoods. From these five dimensions, regional-level data are collected on a set of indicators, with which to draw conclusions about the vulnerability of a region or district.	Regional vulnerability; Damage potential; Coping capacity; Population density; Lack of decent housing; Lack of decent standard of living	Khan & Salman (2012)	YES	Yes	Discard	Unit of analysis is too far toward national/regional rather than addressing "local" as I understand it.
Social Resilienc e (Residual)	This framework assesses the capacity of units of analysis (e.g. grazers) to cope and adapt to climate variability. This is done through looking at four dimensions: perceptions of risk; capacity to reorganise; proximity to coping thresholds; and interest in change. In particular, the framework assesses adaptive capacity in terms of the use by (in this case grazers) of climate forecasting technology, and levels of dependency on natural resources.	Resilience; Adaptive Capacity (B); Use of forecasts; Resource dependency; Perception of risk; Ability to plan, learn, reorganise	Marshall (2010)	YES		Discard	
Intensifyi ng vulnerabi lity to food	Vulnerability is situated in a recursive framework which captures a cyclical nature of intensification of vulnerability principally through the negative impacts that coping strategies can have on food security.	Livelihood level issues; Access to sufficient food; Food insecurity; Household and	Misselho rn (2005)	YES		Retain	

insecurity	Vulnerability is conceived principally in terms	community				
(Residual)	of food security, which in turn is conceived in	vulnerability;				
(,	terms of access to food and food productivity.	Livelihood strategies;				
	When food security is negatively impacted	Direct drivers				
	through climatic and non-climatic drivers,					
	vulnerable households and communities					
	respond with particular coping strategies,					
	which can have a recursive effect on future					
	levels of food security.					
Nkondze	At a very general level, this framework	Factors affecting	Nkondze	YES	Retain	
et al	investigates factors affecting household	vulnerability;	et al			
(2013)	vulnerability. An index is constructed through	Household	(2013)			
(Residual)	which to measure vulnerability, which is then	vulnerability to climate				
	analysed against socio-economic data to	change				
	determine the most significant factors					
	influencing levels of household vulnerability.					
Patterns	Cluster pattern analysis is employed in this	Vulnerability IPCC;	Sietz et	YES	Retain	
of	framework to investigate whether there are,	Exposure;	al (2012)			
smallhold	and which, characteristics that explain the	Sensitivity (A);				
er	causal structure of vulnerability to weather	Adaptive capacity (C);				
vulnerabi	extremes. A measure of	Cluster patter analysis;				
lity	household/smallholder vulnerability is	Food security				
(Residual)	created using a combination of IPCC and Food					
	Security household-level indicators. A cluster					
	pattern analysis is then run relating measures					
	of vulnerability to socio-economic and other					
	household-level data to identify					
	characterisitcs, and in particular combinations					
	of characterisitcs that are related to					
	concentrations of vulnerability.					
Livelihoo	On the basis of a mixed methods data	Resilience and	Sallu et	YES	Retain	
d	collection methodology, the concept of	vulnerability of rural	al (2010)			
trajectori	'livelihood trajectories' is explored among	livelihoods;				
es and	households over a period of (in this case) 30	Livelihood trajectories;				
resilience	years. With this long term approach, the	Dynamic natural				
and	framework seeks to generate narrative	resource base;				
vulnerabi	accounts of which livelihood strategies and	Factors influencing				
lity	trajectories lead to resilient and vulnerable	resilience and				

(Residual)	states.	vulnerability				
Determin	The focus is on identifying determinants of	Vulnerability IPCC;	Tesso et	YES	Retain	
ants of	resilience to climate-related shocks.	Determinants of	al (2012)			
Resilienc	Resilience is conceptualised temporally in	Resilience;				
e	terms of the time taken to make a recovery	Household level				
(Residual)	after being impacted by shocks. A	resilience;				
	vulnerability index (in this case based on the	Exposure;				
	framework of the IPCC) is created to compute	Adaptive capacity (A);				
	measures of vulnerability based on household					
	survey data. Classifications of resilience are					
	then created based on the time taken to					
	return to pre-shock states, which are then					
	analysed against the vulnerability data to					
	identify determinants of resilient housholds.					

Appendix J: Scrutiny by first reviewer of construct splits suggested by expert reviewer

Suggested split	Previous classificiation	Suggested classificiation	Sources	My conclusions
lonesco's 'vulnerability' to be split from 'vulnerability IPCC'	Vulnerability (IPCC)	Vulnerability (IPCC)	Antwi-Agyei et al; Baca et al; CARE (2009); Eakin et al (2012); Fussel & Klein; Hahn et al; Jamir et al; Luers et al; Notnbaert et al; Piya et al; Sietz et al; Tesso et al	Expert split is validated Bridging nodes: Merged - [Household vulnerability to climate change]; [local level vulnerability]; [vulnerability A]; [vulnerability as suceptability];
		Vulnerability Ionesco	Ionesco et al	[vulnerability ipcc]; [vulnerability of coffee farming communities]; [vulnerability to climate change] Vulnerability Ionesco et al
Jamir et al's & Sietz et al's 'Exposure' not sufficiently well defined to be verifiably of a kind with general concept of 'exposure'	Exposure	Exposure	Antwi-Agyei et al; Baca et al; Ford & Smit; Fussel & Klein; Hahn et al; Luers et al; Notnbaert et al; Piya et al; Tesso et al	Expert split refuted. Candidates are poorly defined. However they do refer to the work of the IPCC, so we may assume that their definitions correspond to those of the others.
		Exposure – Jamir et al Exposure – Sietz et	Jamir et al; Sietz et al;	No bridging nodes required.
Sensitivity A: definitions of Jamir et al and Notenbaert et al are not sufficiently	Sensitivity A	al Sensitivity A Sensitivity – Jamir	Baca et al; Fussel & Klein; Hahn et al; Piya et al; Sietz et al; Jamir et al	Expert split partly accepted. Notenbaert to be split; Jamir et al to be retained.
well defined to be verifiably placed in the same category		et al Sensitivity – Notenbaert et al	Notenbaert et al	Following the logic of the previous construct, Jamir et al's (poor) definition refers to the IPCC and so can be assumed to be consistent with the others. The definition of Notenbaert however does not refer to any literature that the

Adaptive capacity A: Definitions of Jamir et al and Notenbaert et al are not sufficiently well defined to be verifiably placed in the same category	Adaptive Capacity A	Adaptive Capacity A Adaptive Capacity – Jamir et al Adaptive Capacity – Notenbaert et al	Antwi-Agyei et al; Baca et al; CARE (2009); Fussel & Klein; Hahn et al; Jamir et al; Luers et al; Piya et al; Tesso et al Jamir et al Notenbaert et al	others do. Bridging nodes: Merged - [Sensitivity A][Sensitivity B] Variance – poor definition \\ Sensitivity Expert split partly accepted. Notenbaert to be split; Jamir et al to be retained. See above for reasoning. Bridging nodes: Merged - [Adaptive Capacity A][Adaptive Capacity B][Adaptive Capacity C];
Vulnerability as Expected Poverty: Not enough information in defintion of Günther & Harttgen to confirm uniformity.	Vulnerability as Expected Poverty	Vulnerability as Expected Poverty Vulnerability as Expected Poverty – Günther & Harttgen	Calvo & Dercon; Chhihn & Poch; Deressa et al; Echevin; Mutsvangwa; Sarris & Karfakis Günther & Harttgen	Variance – poor definition \\ Adaptive Capacity Expert split refuted. The definition of Günther & Harttgen, although not very specific, does cite a reference that the others also cites (Chaudhuri 2002). No Bridging nodes required
Poverty: Definitions of Calvo & Dercon; and Deressa et al are too unspecific to confirm uniformity	Poverty	Poverty Poverty – Calvo & Dercon Poverty – Deressa et al	Chhihn & Poch; Sarris & Karfakis Calvo & Dercon Deressa et al	Expert split refuted The expert noted poor definitions as the reason that uniformity cannot be verified. Going back to the original reasons for merging these constructs, 'I am aware that they are not all the same. Yet together they all form parts of a coherent construct. This is the nature of this Stage of research – to move from the specifics of author-reported constructs/frameworks, to analyst-generated synthesised representations of the field.' As the definitions do not support a definite split, then I

Household level: Too little information in each of the two definitions	Household level	Household level – Echevin Household level – Günther & harttgen	Echevin Günther & harttgen	consider the logic of merging them to still hold. No bridging nodes required Expert split refuted. Expert judges that there is too little information in the definitions. However, the definition of Echevin refers to the with or Günther & Harttgen. Therefore they can be considered the same. No bridging nodes
Community level: Too little	Community level	Community level – Echevin	Echevin	required Expert split refuted. Expert judges that there
information in each of the two definitions		Community level - Günther & harttgen	Günther & harttgen	is too little information in the definitions. However, the definition of Echevin refers to the with or Günther & Harttgen. Therefore they can be considered the same. No bridging nodes required
Farmer perceptions: two examples; one definition is imprecise	Farmer perceptions	Adaptation to long- term climate change Farmer perceptions	Gandure et al Mubaya et al	Expert split refuted. The suggestion to split is not based on a positive detection of divergence, rather on the basis that the definition of Gandure et al does not contain enough information for the classification to be confirmed. The original merger of these constructs was done in part with a view to collecting residuals that shared some broad characterisitics, including that they use broadly defined concepts so as to allow for conceptual development in qualitative research. No bridging nodes

		required.

Appendix K: Emic-Etic construct map

Emic constructs	Bridging construct GS-IT	Etic constructs
ability to plan, learn, reorganise		
access to sufficient food		
adaptation ot long term climate	Merged - [adaptation to long term	Farmer perceptions
change	climate change]; [Farmer perceptions]	
adaptation strategy	Merged - [adaptation strategy]; [Impacts & responses to Hurricane Stan by coffee farmers]	Adaptation Strategy
adaptive capacity	Merged - [Adaptive Capacity A][Adaptive Capacity B][Adaptive Capacity C]	Adaptive Capacity
	Variance – poor definition \\ adaptive capacity	
Adaptiveness		
Agency		
Asset vulnerability		Asset vulnerability
biophyisical conditions		
Climate and non-climate shocks		
climate change		
climate change and variability		
climatic risk factors		
cluster pattern analysis		Cluster pattern analysis
communities at risk of climate		
shocks		
community level		Community level
Community Resilience		
coping capacity		
coping strategies		
covariate shocks		Covariate shocks
cross-scalar teleconnection		Cross scalar teleconnections
current adaptive capacity		Current Adaptive Capacity
Current exposure	Merged - [Current exposure]; [exposure]	Exposure
current poverty status		
Current vulnerability		Current vulnerability
damage potential		
Determinants of Poverty & Vulnerability		
Determinants of resilience		Determinants of Resilience
Direct drivers		
Disaster		
dynamic natural resource base		
Entity		
environmental shocks		
exogenous drivers		Exogenous drivers
Expected food insecurity		

Expected future food-security status		Expected future food security status
Expected poverty	Merged - [Expected poverty]; [household vulnerability as expected poverty]; [household vulnerability to poverty]; [rural household vulnerability]; [vulnerability B]; [vulnerability to poverty]	Vulnerability as Expected Poverty
Experience of long term climate change		
exposed and sensitive to climate change		
Exposure	Merged - [Current exposure]; [exposure]	Exposure
factors afecting vulnerability		
factors influencing resilience and		Factors influencing resilience and
vulnerability		vulnerability
Farmer perceptions	Merged - [adaptation to long term climate change]; [Farmer perceptions]	Farmer perceptions
food insecurity		Food Insecurity
food security		Food security
future exposure	Merged - [future exposure]; [risk of experiencing climate change shock]	Future exposure
future nutricional status		Future nutritional status
Future vulnerability		Future vulnerability
Health		Health
household and community vulnerability		Household and community vulnerability
household choice		
household consumption	Merged – [household consumption]; [minimum consumption(income) level]; [poverty]; [poverty line]; [welfare indicator]	Poverty
Household consumption(income)		
household level		Household level
household level resilience		Household level resilience
household vulnerability as expected poverty	Merged - [Expected poverty]; [household vulnerability as expected poverty]; [household vulnerability to poverty]; [rural household vulnerability]; [vulnerability B]; [vulnerability to poverty]	Vulnerability as Expected Poverty
household vulnerability to climate change	Merged - [Household vulnerability to climate change]; [local level vulnerability]; [vulnreability A]; [vulnerability as suceptability]; [vulnerability ipcc]; [vulnerability	Vulnerability IPCC

	of coffee farming communities];	
	[vulnerability to climate change]	4
	Variance – poor definition \\	
	household vulnerability to climate	
Household yulaarability ta aayaat	change Merged - [Expected poverty];	Vulnorphility on Exported Deverty
Household vulnerability to poverty		Vulnerability as Expected Poverty
	[household vulnerability as	
	expected poverty]; [household vulnerability to poverty]; [rural	
	household vulnerability];	
	[vulnerability B]; [vulnerability to	
	poverty]	
idiosyncratic shocks		Idiosyncratic shocks
	Morgod [adaptation strates:]	
Impacts & responses to Hurricane	Merged - [adaptation strategy];	Adaptation Strategy
Stan by coffee farmers	[Impacts & responses to Hurricane	
	Stan by coffee farmers]	
Lack of decent housing		
Lack of decent standard of living		
livelihood level issues		
livelihood risks		
Livelihood strategies		Livelihood strategies
livelihood trajectories		Livelihood trajectories
Livelihood vulnerability	Livelihood vulnerability A	Livelihood vulnerability A
	Livelihood vulnerability B	Livelihood vulnerability B
local level vulnerability	Merged - [Household vulnerability	Vulnerability IPCC
	to climate change]; [local level	
	vulnerability]; [vulnreability A];	
	[vulnerability as suceptability];	
	[vulnerability ipcc]; [vulnerability	
	of coffee farming communities];	
minimum consumption(income)	[vulnerability to climate change] Merged – [household	Poverty
level	consumption]; [minimum	
	consumption(income) level];	
	[poverty]; [poverty line]; [welfare	
	indicator]	
Natural disasters and Climate		Natural disaster and climate
variability		change
nested and teleconnected		Nested and teleconnected
livelihood vulnerability		livelihood vulnerability
Nested system		Nested system
non-claimtic stress		
non-climatic risk factors		
Perception of Adida farmers		
perception of risk		
Population density		
Poverty	Merged – [household	Poverty
	consumption]; [minimum	
	consumption(income) level];	
	[poverty]; [poverty line]; [welfare	
	indicator]	

Poverty line	Merged – [household	Poverty
	consumption]; [minimum	
	consumption(income) level];	
	[poverty]; [poverty line]; [welfare	
preference criteria	indicator]	
prepared for adverse		
consequences		
private property		
Propoerty rights		
Propoerty rights regime		
public property		
reference scenarios		
regional vulnerability		
Resilience		
resilience and vulnerability of rural		Resilience and vulnerability of
livelihoods		rural livelihoods
Resilience of rural livelihoods		
resource dependency		
response outcomes		Response outcomes
risk of experiencing climate change	Merged - [future exposure]; [risk	Future exposure
shock	of experiencing climate change	
	shock]	
risk-induced poverty		
Rural household vulnerability	Merged - [Expected poverty];	Vulnerability as Expected Poverty
	[household vulnerability as	
	expected poverty]; [household	
	vulnerability to poverty]; [rural	
	household vulnerability];	
	[vulnerability B]; [vulnerability to	
Sefl-organising	poverty]	
Sensitivity	Merged - [Sensitivity A][Sensitivity	Sensitivity
Scholivity	B]	Jensitivity
	Variance – poor definition \\	
	Sensitivity	
Shocks		
Socio-demographic profile		Socio-demographic Profile
socio-economic conditions		
Stimulus		
threat to livelihoods		
use of forecasts		
Vulnerability	Merged - [Household vulnerability	Vulnerability IPCC
	to climate change]; [local level	
	vulnerability]; [vulnreability A];	
	[vulnerability as suceptability];	
	[vulnerability ipcc]; [vulnerability	
	of coffee farming communities];	
	[vulnerability to climate change]	
	Merged - [Expected poverty];	Vulnerability as Expected Poverty
	[household vulnerability as	
	expected poverty]; [household	

	vulnerability to poverty]; [rural	
	household vulnerability];	
	[vulnerability B]; [vulnerability to	
	poverty]	
	Vulnerability lonesco et al	
	Variance – poor definition \\	
	Vulnerability	
Vulnerability as suceptability	Merged - [Household vulnerability	Vulnerability IPCC
	to climate change]; [local level	
	vulnerability]; [vulnreability A];	
	[vulnerability as suceptability];	
	[vulnerability ipcc]; [vulnerability	
	of coffee farming communities];	
	[vulnerability to climate change]	
Vulnerability ipcc	Merged - [Household vulnerability	Vulnerability IPCC
<i>,</i> ,	to climate change]; [local level	
	vulnerability]; [vulnreability A];	
	[vulnerability as suceptability];	
	[vulnerability ipcc]; [vulnerability	
	of coffee farming communities];	
	[vulnerability to climate change]	
Vulnerability of coffee farming	Merged - [Household vulnerability	Vulnerability IPCC
communities	to climate change]; [local level	
	vulnerability]; [vulnreability A];	
	[vulnerability as suceptability];	
	[vulnerability ipcc]; [vulnerability	
	of coffee farming communities];	
	[vulnerability to climate change]	
vulnerability to climate change	Merged - [Household vulnerability	Vulnerability IPCC
valierability to enhance enange	to climate change]; [local level	
	vulnerability]; [vulnreability A];	
	[vulnerability as suceptability];	
	[vulnerability ipcc]; [vulnerability	
	of coffee farming communities];	
	[vulnerability to climate change]	
vulnerability to climate risks		Vulnerability to climate risks
vulnerability to poverty	Merged - [Expected poverty];	Vulnerability as Expected Poverty
vullerability to poverty	[household vulnerability as	vullerability as Expected Foverty
	expected poverty]; [household	
	vulnerability to poverty]; [rural	
	household vulnerability];	
	[vulnerability B]; [vulnerability to	
	poverty]	
vulnerbaility to future food	Ferendi 1	
insecurity		
Water		Water
welfare indicator	Merged – [household	Poverty
	consumption]; [minimum	
	consumption(income) level];	
	[poverty]; [poverty line]; [welfare	
	indicator]	
Welfare of rural housholds		

Appendix L: Records of operationalizations assessed as not transparent or partially transparent

Structured summary of operationaliz Construct: Possible states of the work		וכוונץ מששבששווכות
Article: Calvo & Dercon (2012)	u	
Criterion	Assessment	Quoted text or Rationale for negative assessment
Construct defined?	Yes	the probability of low outcomes or overall risk exposure (as
		defined in Rothschild and Stigliz 1970) increases.
Data collection methods reported?	Yes	To illustrate the insights that could be gained from our individual and aggregate mea- sures of vulnerability, we use three rounds (1994, 1999 and 2004) of a rural household panel data survey from Ethiopia, on 15 villages and about 1,400 households.18 []
		Secondly, we identify shocks directly by using data on the historical rainfall distribution and reported shocks such as illness, price and market shocks, and asset losses. Details on specific features of the data (including on sampling, coverage and issues such as the low attrition in the data) can be found in Dercon et al. (2005).
Reporting of indicators/questions	No	Some physical data consists of 2ndary data, and sufficient
used to operationalise construct?		information is given. However, primary household data is not reported on sufficiently.
		This is the report of 2ndary data: "Secondly, we identify shocks directly by using data on the historical rainfall distribution and reported shocks such as illness, price and market shocks, and asset losses. Details on specific features of the data (including on sampling, coverage and issues such as the low attrition in the data) can be found in Dercon et al. (2005)."
Sampling strategies reported?	No	Some physical data consists of 2ndary data, and sufficient information is given. However, primary household data is not reported on sufficiently. This is the report of 2ndary data: "Secondly, we identify shocks directly by using data on the historical rainfall distribution and reported shocks such as illness, price and market shocks, and asset losses. Details on specific features of the data (including on sampling, coverage and issues such as the low attrition in the data) can be found in Dercon et al. (2005)."
Sampling sizes reported?	Yes	To illustrate the insights that could be gained from our individual and aggregate mea- sures of vulnerability, we use three rounds (1994, 1999 and 2004) of a rural household panel data survey from Ethiopia, on 15 villages and about 1,400 households.18 [] Secondly, we identify shocks directly by using data on the historical rainfall distribution and reported shocks such as illness, price and market shocks, and asset losses. Details on specific features of the data (including on sampling,

		coverage and issues such as the low attrition in the data) can be found in Dercon et al. (2005).
Data analysis methods reported?	Yes/no	
Conclusion		
Transparency Conclusion:	Not transparer	nt

Structured summary of operationalization – transparency assessment		
Construct: Poverty line		
Article: Calvo & Dercon (2012)		
Criterion	<u>Assessment</u>	Quoted text or Rationale for negative assessment
Construct defined?	Yes	Our aim is merely to make an ex-ante statement on the vulnerability of the individual to fall below a poverty norm z,
Data collection methods reported?	Yes/no	
Reporting of indicators/questions used to operationalise construct?	No	In their empirical example, they do not define what threshold they use for their poverty norm.
Sampling strategies reported?	Yes/no	
Sampling sizes reported?	Yes/no	
Data analysis methods reported?	Yes/no	
Conclusion		
Transparency Conclusion:	Not transpare	nt

Structured summary of operationalized	zation – transpa	rency assessment
Construct: Probabilities of possible states of the world		
Article: Calvo & Dercon (2012)		
<u>Criterion</u>	Assessment	Quoted text or Rationale for negative assessment
Construct defined?	Yes	the probability of low outcomes or overall risk exposure (as defined in Rothschild and Stigliz 1970) increases.
Data collection methods reported?	Yes	To illustrate the insights that could be gained from our individual and aggregate mea- sures of vulnerability, we use three rounds (1994, 1999 and 2004) of a rural household panel data survey from Ethiopia, on 15 villages and about 1,400 households.18 [] Secondly, we identify shocks directly by using data on the historical rainfall distribution and reported shocks such as illness, price and market shocks, and asset losses. Details on specific features of the data (including on sampling, coverage and issues such as the low attrition in the data) can be found in Dercon et al. (2005).
Reporting of indicators/questions used to operationalise construct?	No	Some physical data consists of 2ndary data, and sufficient information is given. However, primary household data is not reported on sufficiently. This is the report of 2ndary data:
		"Secondly, we identify shocks directly by using data on the historical rainfall distribution and reported shocks such as illness, price and market shocks, and asset losses. Details on

		specific features of the data (including on sampling, coverage and issues such as the low attrition in the data) can be found in Dercon et al. (2005)."
Sampling strategies reported?	No	Some physical data consists of 2ndary data, and sufficient information is given. However, primary household data is not reported on sufficiently. This is the report of 2ndary data: "Secondly, we identify shocks directly by using data on the historical rainfall distribution and reported shocks such as illness, price and market shocks, and asset losses. Details on specific features of the data (including on sampling, coverage and issues such as the low attrition in the data) can be found in Dercon et al. (2005)."
Sampling sizes reported?	Yes	To illustrate the insights that could be gained from our individual and aggregate mea- sures of vulnerability, we use three rounds (1994, 1999 and 2004) of a rural household panel data survey from Ethiopia, on 15 villages and about 1,400 households.18 [] Secondly, we identify shocks directly by using data on the historical rainfall distribution and reported shocks such as illness, price and market shocks, and asset losses. Details on specific features of the data (including on sampling, coverage and issues such as the low attrition in the data) can be found in Dercon et al. (2005).
Data analysis methods reported?	Yes/no	
<u>Conclusion</u>	-	
Transparency Conclusion:	Not transparent	

Structured summary of operationalization – transparency assessment Construct: Risk management		
<u>Criterion</u>	<u>Assessment</u>	Quoted text or Rationale for negative assessment
Construct defined?	YES	conceptual framework drawn from it by Løvendal and Knowles (2005).
Data collection methods reported?	No	In the theoretical framework, 'Risk' and 'risk management' are subconstructs of 'events' that are to occur at time t ₀ -t ₁ . However, the authors only use ex-post data, implying that they only have data for t ₀ , ie current risk and risk managment: "In this application, we are not able to complement this with information on future risks and risk management strategies."
Reporting of indicators/questions used to operationalise construct?	No	In the theoretical framework, 'Risk' and 'risk management' are subconstructs of 'events' that are to occur at time t_0-t_1 . However, the authors only use ex-post data, implying that they only have data for t_0 , ie current risk and risk managment: "In this application, we are not able to complement this

		with information on future risks and risk management strategies."
Sampling strategies reported?	Yes/no	
Sampling sizes reported?	Yes/no	
Data analysis methods reported?	Yes/no	
Conclusion		
Transparency Conclusion:	Not transparent	

Structured summary of operationalize	ation – transpa	rency assessment
Construct: Risks		
Article: Capaldo et al (2010)		
Criterion	<u>Assessment</u>	Quoted text or Rationale for negative assessment
Construct defined?	YES	conceptual framework drawn from it by Løvendal and Knowles (2005).
Data collection methods reported?	No	In the theoretical framework, 'Risk' and 'risk management' are subconstructs of 'events' that are to occur at time to-t1. However, the authors only use ex-post data, implying that they only have data for to, ie current risk and risk managment: "In this application, we are not able to complement this with information on future risks and risk management strategies."
Reporting of indicators/questions used to operationalise construct?	No	In the theoretical framework, 'Risk' and 'risk management' are subconstructs of 'events' that are to occur at time t ₀ -t ₁ . However, the authors only use ex-post data, implying that they only have data for t ₀ , ie current risk and risk managment: "In this application, we are not able to complement this with information on future risks and risk management strategies."
Sampling strategies reported?	Yes/no	
Sampling sizes reported?	Yes/no	
Data analysis methods reported?	Yes/no	
Conclusion		
Transparency Conclusion:	Not transpare	nt

Structured summary of operationalization – transparency assessment		
Construct: Current poverty status		
Article: Chhinh & Poch (2012)		
Criterion	Assessment	Quoted text or Rationale for negative assessment
Construct defined?	Yes	This study adopts the approach to measuring household economic vulnerability posited and elaborated in Chaudhuri's (2003) study of household vulnerability
Data collection methods reported?	Yes	A total of 600 questionnaires were collected from households.
Reporting of indicators/questions used to operationalise construct?	No	The closest that the paper comes to reporting survey questions is this: "Unlike Chaudhuri (2003), who analysed households'

Sampling strategies reported?	Νο	monthly per capita consumption expenditure, this study analyses households' monthly income to measure the household vulnerability index due to the lack of expenditure data." However, we still don't know how data on households' monthly income was generated.
Sampling sizes reported?	Yes	A total of 600 questionnaires were collected from households.
Data analysis methods reported?	Yes/no	
Conclusion	•	
Transparency Conclusion:	Not Transparent	

Structured summary of operationaliz	ation – transpa	rency assessment
Construct: Environmental shocks		
Article: Chhinh & Poch (2012)		
<u>Criterion</u>	Assessment	Quoted text or Rationale for negative assessment
Construct defined?	Yes	This study adopts the approach to measuring household economic vulnerability posited and elaborated in Chaudhuri's (2003) study of household vulnerability
Data collection methods reported?	No	This is ambigious. On the one hand, the paper reports that data on natural disasters was obtained from key informant interviews: "Three natural disasters were considered: flash flooding, drought, and windstorms. Areas were defined using Geographical Information Systems, which can be used to produce a Digital El- evation Model. Administrative boundaries were used to define provinces, districts and communes. Natural disaster occurrence was based on information given from key informant interviews from the Sub-national and local authorizes. A total of 600 questionnaires were collected from households." However, later, they report that data on environmental shocks was obtained through asking households if they had experienced flood, windstorms, or drought in the previous 12 years. (see reporting of indicators)
Reporting of indicators/questions used to operationalise construct?	Yes/no	The three natural hazards that impact on people's livelihoods in Cambodia including flood, wind- storms and drought are investigated in this paper. It is important to note that the indicators of these events are measured as dummy, indicating whether the respondents have experienced drought, flood and windstorm over the last 12 years (1999-2010). As indicated in Table 2, an overwhelming majority of respondents have reported experiencing drought ranging in the last 12 years. In the rural communities of Morhasaing, Peang Lvea and Tasal, 100 % of the respondents reported experiencing drought. In contrast, the percentages of respond- ents who have experienced floods or windstorms in those 12 years are significantly lower than those who have experience

		drought.
Sampling strategies reported?	No	
Sampling sizes reported?	No	
Data analysis methods reported?	Yes/no	
Conclusion		
Transparency Conclusion:	NOT TRANSPARENT	

Structured summary of operationalized	zation – transpa	rency assessment
Construct: Poverty		
Article: Chhinh & Poch (2012)		
Criterion	<u>Assessment</u>	Quoted text or Rationale for negative assessment
Construct defined?	Yes	Technically, the household vulnerability index is derived from the difference between the expected log per capita income and the minimum log per capita income threshold, with households having per capita incomes lower than the minimum per capita income defined as vulnerable (poor). The expected log per capita income is estimated using the three-step feasible generalised least squares (FGLS) method.
Data collection methods reported?	Yes	A total of 600 questionnaires were collected from households.
Reporting of indicators/questions used to operationalise construct?	No	The closest that the paper comes to reporting survey questions is this: "Unlike Chaudhuri (2003), who analysed households' monthly per capita consumption expenditure, this study analyses households' monthly income to measure the household vulnerability index due to the lack of expenditure data." However, we still don't know how data on households' monthly income was generated.
Sampling strategies reported?	No	
Sampling sizes reported?	Yes	A total of 600 questionnaires were collected from households.
Data analysis methods reported?	Yes/no	The expected log per capita income obtained from the above FGLS analysis was used to create vulnerability index at a US \$1.00 daily threshold (Cambodia poverty line) and at a US \$1.25 daily threshold.
<u>Conclusion</u>		
Transparency Conclusion:	Not transpare	nt

Structured summary of operationalization – transparency assessment			
Construct: Exogenous drivers			
Article: Eakin et al (2008)			
Criterion	Assessment Quoted text or Rationale for negative assessment		
Construct defined?	Yes	exogenous drivers (i.e. the risk and stress factors)	
Data collection methods reported?	Yes/no	In the following sections we draw from a variety of primary and secondary sources to illustrate how the livelihood responses of coffee farmers in Mexico and Vietnam are	

		 linked through their integration into global markets and the social and environ- mental outcomes of their adaptation choices. [] Specifically, we draw on two case studies of coffee-producing households and communities in Mexico and Vietnam [] The Mexican case study took place in 2003, as farmers were emerging from the most recent coffee crisis. The research took place in two coffee-producing communities in the region of Coatepec, in Central Veracruz. In addition to interviews with public officials, coffee association leaders, academics and coffee processors and traders, a household survey collected data on the perceptions and responses of 60 households to the coffee situation (Eakin et al., 2006). The project was part of a broader study exploring the implications of climatic variability and change for coffee farming in Mexico (Gay Garcia et al., 2006). In Vietnam, a study of migrant livelihoods included many coffee farmers, mostly migrants to the Central Highland region (Winkels, 2004). Livelihood surveys and interviews with 81 households originating from the overpopulated Red River Delta in the north provides important insights into both the opportunities andrisk of coffee farming at Vietnam's southern mountain frontier when the first signs of the looming coffee crisis became evident in 2000 and 2001.
Reporting of indicators/questions used to operationalise construct?	No	
Sampling strategies reported?	Yes/no	In this paper we therefore focus our examination on the causes for, and outcomes of, coffee farmers' vulnerability in Mexico and Vietnam in three periods during which global coffee production and trade underwent significant changes. The aim is to highlight not only how global changes affect smallholders in (dis)similar ways across different coffee- producing nations but also in describing how local responses and livelihood vulnerabilities are linked across space and time.
Sampling sizes reported?	Yes/no	two case studies of coffee-producing households and communities in Mexico and Vietnam [] in three periods during which global coffee production and trade underwent significant changes.
Data analysis methods reported?	No	
Conclusion	1	
Transparency Conclusion:	No	

Structured summary of operationalization – transparency assessment

Construct: geographically distant household vulnerability

Article: Eakin et al (2008)

Criterion	Assessment	Quoted text or Rationale for negative assessment
Construct defined?	Yes	vulnerabilities and responses of farm households in distinct
		geographic locations
Data collection methods reported?	Yes/no	In the following sections we draw from a variety of primary and secondary sources to illustrate how the livelihood responses of coffee farmers in Mexico and Vietnam are linked through their integration into global markets and the social and environ- mental outcomes of their adaptation choices. [] Specifically, we draw on two case studies of coffee- producing households and communities in Mexico and Vietnam [] The Mexican case study took place in 2003, as farmers were emerging from the most recent coffee crisis. The research took place in two coffee-producing communities in the region of Coatepec, in Central Veracruz. In addition to interviews with public officials, coffee association leaders, academics and coffee processors and traders, a household survey collected data on the perceptions and responses of 60 households to the coffee situation (Eakin et al., 2006). The project was part of a broader study exploring the implications of climatic variability and change for coffee farming in Mexico (Gay Garcia et al., 2006). In Vietnam, a study of migrant livelihoods included many coffee farmers, mostly migrants to the Central Highland region (Winkels, 2004). Livelihood surveys and interviews with 81 households originating from the overpopulated Red River Delta in the north provides important insights into both the opportunities andrisk of coffee farming at
		Vietnam's southern mountain frontier when the first signs of the looming coffee crisis became evident in 2000 and
		2001.
Reporting of indicators/questions	No	
used to operationalise construct?		
Sampling strategies reported?	Yes/no	In this paper we therefore focus our examination on the causes for, and outcomes of, coffee farmers' vulnerability in Mexico and Vietnam in three periods during which global coffee production and trade underwent significant changes. The aim is to highlight not only how global changes affect smallholders in (dis)similar ways across different coffee- producing nations but also in describing how local responses and livelihood vulnerabilities are linked across space and time.
Sampling sizes reported?	Yes/no	two case studies of coffee-producing households and communities in Mexico and Vietnam [] in three periods during which global coffee production and trade underwent significant changes.
Data analysis methods reported?	No	-

Conclusion		Conclusion
Transparency Conclusion:	No	

Article: Eakin et al (2008)		
Criterion	Assessment	Quoted text or Rationale for negative assessment
Construct defined?	Yes	geographically specific signals of change – such as a shift in market opportunities, a drought, a change in public policy or new form of land use in a specific location –
Data collection methods reported?	Yes/no	In the following sections we draw from a variety of primary and secondary sources to illustrate how the livelihood responses of coffee farmers in Mexico and Vietnam are linked through their integration into global markets and the social and environ- mental outcomes of their adaptation choices. [] Specifically, we draw on two case studies of coffee- producing households and communities in Mexico and Vietnam [] The Mexican case study took place in 2003, as farmers were emerging from the most recent coffee crisis. The research took place in two coffee-producing communities in the region of Coatepec, in Central Veracruz. In addition to interviews with public officials, coffee association leaders, academics and coffee processors and traders, a household survey collected data on the perceptions and responses of 60 households to the coffee situation (Eakin et al., 2006). The project was part of a broader study exploring the implications of climatic variability and change for coffee farming in Mexico (Gay Garcia et al., 2006). In Vietnam, a study of migrant livelihoods included many coffee farmers, mostly migrants to the Central Highland region (Winkels, 2004). Livelihood surveys and interviews with 81 households originating from the overpopulated Rec River Delta in the north provides important insights into both the opportunities andrisk of coffee farming at Vietnam's southern mountain frontier when the first signs of the looming coffee crisis became evident in 2000 and 2001.
Reporting of indicators/questions used to operationalise construct?	No	
Sampling strategies reported?	Yes/no	In this paper we therefore focus our examination on the causes for, and outcomes of, coffee farmers' vulnerability ir Mexico and Vietnam in three periods during which global coffee production and trade underwent significant changes The aim is to highlight not only how global changes affect smallholders in (dis)similar ways across different coffee- producing nations but also in describing how local responses and livelihood vulnerabilities are linked across

		space and time.]
Sampling sizes reported?	Yes/no	 two case studies of coffee-producing households and communities in Mexico and Vietnam [] in three periods during which global coffee production and trade underwent significant changes. 	
Data analysis methods reported?	No		
Conclusion			Conclusion
Transparency Conclusion:	No		

Article: Eakin et al (2008)		
Criterion	Assessment	Quoted text or Rationale for negative assessment
Construct defined?	Yes	factors internal to the household (i.e. ability to mitigate and cope with stress)
Data collection methods reported?	Yes/no	In the following sections we draw from a variety of primary and secondary sources to illustrate how the livelihood responses of coffee farmers in Mexico and Vietnam are linked through their integration into global markets and the social and environ- mental outcomes of their adaptation choices. [] Specifically, we draw on two case studies of coffee- producing households and communities in Mexico and Vietnam [] The Mexican case study took place in 2003, as farmers were emerging from the most recent coffee crisis. The research took place in two coffee-producing communities in the region of Coatepec, in Central Veracruz. In addition to interviews with public officials, coffee association leaders, academics and coffee processors and traders, a household survey collected data on the perceptions and responses of 60 households to the coffee situation (Eakin et al., 2006). The project was part of a broader study exploring the implications of climatic variability and change for coffee farming in Mexico (Gay Garcia et al., 2006). In Vietnam, a study of migrant livelihoods included many coffee farmers, mostly migrants to the Central Highland region (Winkels, 2004). Livelihood surveys and interviews with 81 households originating from the overpopulated Rec River Delta in the north provides important insights into both the opportunities andrisk of coffee farming at Vietnam's southern mountain frontier when the first signs of the looming coffee crisis became evident in 2000 and 2001.
Reporting of indicators/questions	No	
used to operationalise construct?		
Sampling strategies reported?	Yes/no	In this paper we therefore focus our examination on the causes for, and outcomes of, coffee farmers' vulnerability in

Sampling sizes reported?	Yes/no	Mexico and Vietnam in three periods during which global coffee production and trade underwent significant changes.The aim is to highlight not only how global changes affect smallholders in (dis)similar ways across different coffee- producing nations but also in describing how local responses and livelihood vulnerabilities are linked across space and time.two case studies of coffee-producing households and communities in Mexico and Vietnam [] in three periods during which global coffee production and trade underwent significant changes.	
Data analysis methods reported?	No		
<u>Conclusion</u>			Conclusion
Transparency Conclusion:	No		

Structured summary of operationalization – transparency assessment		
Construct: nested System		
Article: Eakin et al (2008)		
Criterion	Assessment	Quoted text or Rationale for negative assessment
Construct defined?	Yes	In a nested system, profoundchanges inkeyvariablesthatoperatenormallyonly at one level, e.g., within a defined geographic region or admin- istrative domain, can have non-linear outcomes for processes operating at broader scales of analysis (Gunderson andHolling, 2001). Local level processes can episodically influence larger scale phenomena, and such explosive "upward cascades" can be sources of surprise at distant locations.
Data collection methods reported?	Yes/no	In the following sections we draw from a variety of primary and secondary sources to illustrate how the livelihood responses of coffee farmers in Mexico and Vietnam are linked through their integration into global markets and the social and environ- mental outcomes of their adaptation choices. [] Specifically, we draw on two case studies of coffee- producing households and communities in Mexico and Vietnam [] The Mexican case study took place in 2003, as farmers were emerging from the most recent coffee crisis. The research took place in two coffee-producing communities in the region of Coatepec, in Central Veracruz. In addition to interviews with public officials, coffee association leaders, academics and coffee processors and traders, a household survey collected data on the perceptions and responses of 60 households to the coffee situation (Eakin et al., 2006). The project was part of a broader study exploring the implications of climatic variability and change for coffee farming in Mexico (Gay Garcia et al., 2006). In Vietnam, a

Transparency Conclusion:	No		
<u>Conclusion</u>	-		Conclusio
Data analysis methods reported?	No		
Sampling sizes reported?	Yes/no	 two case studies of coffee-producing households and communities in Mexico and Vietnam [] in three periods during which global coffee production and trade underwent significant changes. 	
Reporting of indicators/questions used to operationalise construct? Sampling strategies reported?	No Yes/no	Vietnam's southern mountain frontier when the first signs of the looming coffee crisis became evident in 2000 and 2001. In this paper we therefore focus our examination on the causes for, and outcomes of, coffee farmers' vulnerability in Mexico and Vietnam in three periods during which global coffee production and trade underwent significant changes. The aim is to highlight not only how global changes affect smallholders in (dis)similar ways across different coffee- producing nations but also in describing how local responses and livelihood vulnerabilities are linked across space and time.	
		study of migrant livelihoods included many coffee farmers, mostly migrants to the Central Highland region (Winkels, 2004). Livelihood surveys and interviews with 81 households originating from the overpopulated Red River Delta in the north provides important insights into both the opportunities andrisk of coffee farming at	

Structured summary of operationaliz	ation – transpa	rency assessment
Construct: Response outcome		
Article: Eakin et al (2008)		
<u>Criterion</u>	Assessment	Quoted text or Rationale for negative assessment
Construct defined?	Yes	outcomes of these responses in terms of individual or household welfare.
Data collection methods reported?	Yes/no	In the following sections we draw from a variety of primary and secondary sources to illustrate how the livelihood responses of coffee farmers in Mexico and Vietnam are linked through their integration into global markets and the social and environ- mental outcomes of their adaptation choices. [] Specifically, we draw on two case studies of coffee- producing households and communities in Mexico and Vietnam [] The Mexican case study took place in 2003, as farmers were emerging from the most recent coffee crisis. The research took place in two coffee-producing communities in the region of Coatepec, in Central Veracruz. In addition to interviews with public officials, coffee association leaders,

Reporting of indicators/questions used to operationalise construct?	No	academics and coffee processors and traders, a household survey collected data on the perceptions and responses of 60 households to the coffee situation (Eakin et al., 2006). The project was part of a broader study exploring the implications of climatic variability and change for coffee farming in Mexico (Gay Garcia et al., 2006). In Vietnam, a study of migrant livelihoods included many coffee farmers, mostly migrants to the Central Highland region (Winkels, 2004). Livelihood surveys and interviews with 81 households originating from the overpopulated Red River Delta in the north provides important insights into both the opportunities andrisk of coffee farming at Vietnam's southern mountain frontier when the first signs of the looming coffee crisis became evident in 2000 and 2001.	
Sampling strategies reported?	Yes/no	In this paper we therefore focus our examination on the causes for, and outcomes of, coffee farmers' vulnerability in Mexico and Vietnam in three periods during which global coffee production and trade underwent significant changes. The aim is to highlight not only how global changes affect smallholders in (dis)similar ways across different coffee- producing nations but also in describing how local responses and livelihood vulnerabilities are linked across space and time.	
Sampling sizes reported?	Yes/no	two case studies of coffee-producing households and communities in Mexico and Vietnam [] in three periods during which global coffee production and trade underwent significant changes.	
Data analysis methods reported?	No		
Conclusion			Conclusion
Transparency Conclusion:	No		

Structured summary of operationali	zation – transpa	rency assessment	
Construct: future exposure			
Article: Ford & Smit (2004)			
Criterion	Assessment	Quoted text or Rationale for negative assessment	
Construct defined?	Yes	Future exposure also includes estimating the future state of the socioeco- nomic conditions, given that exposure is a property of the system relative to risk.	
Data collection methods reported?	Yes	Assessing future exposure involves collaboration with the climate science community to estimate the likelihood of changes in cli- matic attributes identified by the community	
Reporting of indicators/questions used to operationalise construct?	Yes	Assessing future exposure involves collaboration with the climate science community to estimate the likelihood of changes in cli- matic attributes identified by the community. For exam- ple, will extreme events or climatic variability	

		continue to increase? Will the unexpected winds that have caused problems to hunters in many Nunavut communities be- come even stronger and less predictable? Will the storm surges that have damaged infrastructure and sea defenses increase in magnitude or frequency? Which areas will experience most exposure to erosion? Future exposure also includes estimating the future state of the socioeco- nomic conditions, given that exposure is a property of the system relative to risk.
Sampling strategies reported?	No	
Sampling sizes reported?	No	
Data analysis methods reported?	No	
Conclusion		
Transparency Conclusion:	No	

Construct: Adaptation to long term c	limate change			
Article: Gandure et al (2013)				
Criterion	Assessment	Quoted text or Rationale for negative assessment		
Construct defined?	Yes	Unique in our study, is the use of individual perceptions in identifying and understanding the processes of adaptation in an area that has undergone significant political and socio- economic reformation resulting from a series of conflicts over land resources.		
Data collection methods reported?	Yes/no	The study relied on the experience and knowledge of farmers and community members in Gladstone to characterise their livelihood risks fromclimatic and non-climatic risk factors. The groups brain stormed their risks and then ranked them. A total of 13 focus group discussions were organised comprising an average of ninemembers per group. One groupwas composed entirely of youth (6male and 5 female) aged between 20 and 36 years. In general, the groups represented various land and farming types and social groups in Gladstone. A deliberate attempt was made to include farmers from both the new and old land stands and those with and without access to piped water fromcommunity stand pipes within a distance 200m from the house. Two research assistants were selected from the Gladstone community and were trained in data capture and facilitation skills. They assisted in arranging themeetings and provided translation during the facilitation of the focus group discussions. [] Open ended questions were used to seek information on actions farmers take to adapt to perceived changes in temperature		
Reporting of indicators/questions used to operationalise construct?	Yes	Open ended questions were used to seek information on actions farmers take to adapt to perceived changes in temperature and rainfall and whether these		

		actions were temporary or permanent. Firstly, farmerswere askedwhether they had changed theirway of life due to climate change. If the answerwas yes, then follow up questions of how they had changed andwhether they felt the changewas temporary or permanent were asked. If the answer was no, the reason(s) for not changing were then probed.
Sampling strategies reported?	No	
Sampling sizes reported?	No	
Data analysis methods reported?	No	Although the paper does report on results of the analysis of the data of this specific construct, nowhere do they mention any methods of data analysis: "The primary adaptation strategies used by farmers in Gladstone include the use of water harvesting techniques; changes in crop planting dates, changes in agriculture practices, and changes in crops grown (Table 2). The use of the various strategies is driven by both climate and non- climatic factors"
Conclusion	•	
Transparency Conclusion:	No	

Construct: Perception of long term climate change		
Article: Gandure et al (2013)		
Criterion	<u>Assessment</u>	Quoted text or Rationale for negative assessment
Construct defined?	Yes	Unique in our study, is the use of individual perceptions in identifying and understanding the processes of adaptation in an area that has undergone significant political and socio- economic reformation resulting from a series of conflicts over land resources.
Data collection methods reported?	Yes/no	The study relied on the experience and knowledge of farmers and community members in Gladstone to characterise their livelihood risks fromclimatic and non-climatic risk factors. The groups brain stormed their risks and then ranked them. A total of 13 focus group discussions were organised comprising an average of ninemembers per group. One groupwas composed entirely of youth (6male and 5 female) aged between 20 and 36 years. In general, the groups represented various land and farming types and social groups in Gladstone. A deliberate attempt was made to include farmers from both the new and old land stands and those with and without access to piped water fromcommunity stand pipes within a distance 200m from the house. Two research assistants were selected from the Gladstone community and were trained in data capture and facilitation skills. They assisted in arranging themeetings and provided translation during the facilitation of the focus group discussions. [] Farmers' perceptions were sought by means of open ended questions on their observations/ experiences of long-term

		changes in temperature and/or rainfall
Reporting of indicators/questions used to operationalise construct?	Yes/no	Farmers' perceptions were sought by means of open ended questions on their observations/ experiences of long-term changes in temperature and/or rainfall. For temperature, farmers' opinions were sought on whether it has become warmer, cooler, more extreme, or no change noted. They could also report any other characteristics noted or say they did not know. Similarly, rainfall could be perceived as wetter, drier, more extreme, no change noted, other characteristics noted or admit to having no knowledge. Additional questions were asked on the manner in which changes occurred and farmers' perceptions of these changes.
Sampling strategies reported?	No	
Sampling sizes reported?	No	
Data analysis methods reported?	No	Although the paper does report on results of the analysis of the data of this specific construct, nowhere do they mention any methods of data analysis: "All groups regardless of age and gender agreed that Gladstone is experiencing long-term changes in rainfall and temperature (Table 1)."
<u>Conclusion</u>	•	
Transparency Conclusion:	No	

Structured summary of ope	erationalization	- transparency assessment		
Construct: Adaptive Capacit	Σ γ			
Article: Jamir et al (2013)				
<u>Criterion</u>	Assessment	Quoted text or Rationale for negative assessment		
Construct defined?	Yes	Asper theIPCC's definition and framework, vulnerability is understood as a function of three components—exposure, sensitivity and adaptive capacity. Vulnerability is defined as "the degree to which a system is susceptible to or unable to cope with, adverse effects of climate change, including cli- mate variability and extremes" (IPCC 2001).		
Data collection methods reported?	Yes	Household questionnaire surveys and participatory rural appraisal (PRA) were conducted in all the five villages in order to quantify each of these indicators. A total of 150 households (30 households in each village) were randomly selected across the villages for the household questionnaire survey. The PRA was in the form of focus group discussions and semi-structured interviews. The group discussions with the community, village council members and district offi- cials gave an insight into the local problems. [] Based on the response of the farmers and the village council members during household surveys and PRA, the mean, minimum and maximum values for each of the indicators were obtained. Secondary data were used for those indicators that could not be quantified by this approach.		
Reporting of indicators/questions used	Yes	Table 2 Description and rationale for indicators selected for the vulnerability assessment		
to operationalise		Component Indicator Indicator Rationale		

construct?	indicators	description	units	
construct?	Total annual crop production	description Total annual crop production in the village of major crops including kharif and rabi crops	Tons/year	The total annual crop production in a village gives an overall indication of the agricultural suitability and growing conditions of crops (soil moisture, water availability, absence of pest attacks) and general food security
	Literacy rate	Percentage of literate members in the household	Percentage	The literacy rate among the farmers is indicative of access to non- manual employment and to information regarding overall management in the face of extreme events
	Farm income	Total amount of farm income from the agricultural activities carried out by the farmer	INR	Farm income from all agricultural production activities is indicative of the well-being and adaptive capacity of the farmer.
	Farm holding size	Total size of the farm used for cultivation by the farmers	Area (ha/ acre/local unit)	Higher farm holding size is reflective of more agricultural production and higher

			adaptive capacity of the farmer
Farm assets	Total number of tractors, farm equipments, storage facility, manure and pesticides used by the farmer	Number	The farm assets are indicative of the well- being of the farmers and hence adaptive capacity
Access to health facilities	Distance travelled by the farmers to reach the nearest dispensary/public health centre or hospital	Distance (km)	Distance of the health centers is a major concern especially during a drought or an epidemic
Access to market	The distance travelled by the farmers to the village or town markets to sell their farm products and procure farm inputs on their own or through some intermediaries.	Distance (km)	Access of farmers to the markets would ensure them proper returns from their agricultural produce as well as paying the required amount of money for procuring farm inputs. This is necessary to prevent the interference and usurping of the farmers money by intermediaries
Access to banking facilities	Percentage of farmers having an account in the nearest rural banks	Distance (km)	This indicator is reflective of the access of farmers to agricultural credit
Percentage of area under drought	The percentage of area drought- tolerant crop	Percentage	In those cases, where farmers use

			
resistant crops	varieties		drought-
	(traditional ones		tolerant
	or those supplied		crops, the
	by the State		damage
	agricultural		caused during
	departments)		water
			stressed
			conditions is
			minimized to
			a certain
			extent.
Alternative	Sub-indicators		Having an
livelihood	addressing		alternate
options from	alternate means		source of
forest,	of earning		income apart
livestock, etc.	livelihood (other		from
	than crop		cultivation is
	cultivation, etc.)		necessary for
	such as		farmers to
	dependence on		earn their
	forests, livestock,		living during
	etc.		droughts
			when rainfall
			deficit affects
			agricultural
			yields
Drinking water	Approximate	Liters/	, Drinking
availability	amount of	individual	water is a
,	drinking water		major concern
	available during		during
	droughts		droughts as
	-		
	irrespective of		surface water
	irrespective of source		surface water sources dry up
	irrespective of source		sources dry up
	-		sources dry up and the
	-		sources dry up and the groundwater
	-		sources dry up and the
Percentage of	source	Percentage	sources dry up and the groundwater tables also lower
Percentage of households	source Percentage of	Percentage	sources dry up and the groundwater tables also lower High
households	source Percentage of households	Percentage	sources dry up and the groundwater tables also lower High awareness
households aware of	source Percentage of households having access to	Percentage	sources dry up and the groundwater tables also lower High awareness level of the
households aware of drought	source Percentage of households having access to newspapers,	Percentage	sources dry up and the groundwater tables also lower High awareness level of the farmer about
households aware of drought preparedness	source Percentage of households having access to newspapers, radio, television,	Percentage	sources dry up and the groundwater tables also lower High awareness level of the farmer about impending
households aware of drought preparedness and mitigation	source Percentage of households having access to newspapers,	Percentage	sources dry up and the groundwater tables also lower High awareness level of the farmer about impending extreme
households aware of drought preparedness	source Percentage of households having access to newspapers, radio, television, drought awareness	Percentage	sources dry up and the groundwater tables also lower High awareness level of the farmer about impending extreme events would
households aware of drought preparedness and mitigation	source Percentage of households having access to newspapers, radio, television, drought awareness programs, etc.	Percentage	sources dry up and the groundwater tables also lower High awareness level of the farmer about impending extreme events would give him an
households aware of drought preparedness and mitigation	source Percentage of households having access to newspapers, radio, television, drought awareness	Percentage	sources dry up and the groundwater tables also lower High awareness level of the farmer about impending extreme events would give him an idea to make
households aware of drought preparedness and mitigation	source Percentage of households having access to newspapers, radio, television, drought awareness programs, etc.	Percentage	sources dry up and the groundwater tables also lower High awareness level of the farmer about impending extreme events would give him an idea to make adjustments
households aware of drought preparedness and mitigation	source Percentage of households having access to newspapers, radio, television, drought awareness programs, etc.	Percentage	sources dry up and the groundwater tables also lower High awareness level of the farmer about impending extreme events would give him an idea to make adjustments in the
households aware of drought preparedness and mitigation	source Percentage of households having access to newspapers, radio, television, drought awareness programs, etc.	Percentage	sources dry up and the groundwater tables also lower High awareness level of the farmer about impending extreme events would give him an idea to make adjustments in the cropping
households aware of drought preparedness and mitigation	source Percentage of households having access to newspapers, radio, television, drought awareness programs, etc.	Percentage	sources dry up and the groundwater tables also lower High awareness level of the farmer about impending extreme events would give him an idea to make adjustments in the cropping pattern and
households aware of drought preparedness and mitigation	source Percentage of households having access to newspapers, radio, television, drought awareness programs, etc.	Percentage	sources dry up and the groundwater tables also lower High awareness level of the farmer about impending extreme events would give him an idea to make adjustments in the cropping

		Compensation received from Government due to losses incurred during a drought/famine	Total amount of compensation received by the drought-affected farmers from the Government agencies, private donor organizations or NGOs	INR	This indicator also gives an idea about the institutional structure and Government interventions which are responsible to ensure whether the farmers have received adequate compensation or not		
Sampling strategies reported?	Yes	appraisal (PRA) we quantify each of th households in each	nnaire surveys and p re conducted in all t lese indicators. A tot n village) were rando questionnaire survey	he five villages al of 150 hous mly selected a	s in order to eholds (30		
Sampling sizes reported?	Yes	Household questionnaire surveys and participatory rural appraisal (PRA) were conducted in all the five villages in order to quantify each of these indicators. A total of 150 households (30 households in each village) were randomly selected across the villages for the household questionnaire survey.					
Data analysis methods reported?	No	The construct adaptive capacity is only opertionalized up to the point of data collection. Afterwards, data is analysed according to a conceptual framework in which this construct is not included.					
Conclusion Transparency Conclusion:	No						

Structured summary of operationalization – transparency assessment					
Construct: Drought					
Article: Jamir et al (2013)					
Criterion	Assessment	Quoted text or Rationale for negative assessment			
Construct defined?	Yes	The India Meteorological Department (IMD) defines drought as a rainfall deficit of 25 % or more from the district-level long-period average (LPA).			
Data collection methods reported?	Yes	Household questionnaire surveys and participatory rural appraisal (PRA) were conducted in all the five villages in order to quantify each of these indicators. A total of 150 households (30 households in each village) were randomly selected across the villages for the household questionnaire survey. The PRA was in the form of focus group discussions and semi-structured interviews. The group discussions with the community, village council members and district offi- cials gave an insight into the local problems. []			

		Based on the response of the farmers and the village council members during household surveys and PRA, the mean, minimum and maximum values for each of the indicators were obtained. Secondary data were used for those indicators that could not be quantified by this approach.			
Reporting of indicators/questions	Yes	Table 2 Description and rationale for indicators selected for			
used to operationalise construct?		the vulnerability assessment			
		Component Indicator Indicator Rationale indicators description units			
		Drought durationTotal amount of time the drought-like conditions persist for more days, persist in the villageMonthsIf the drought-like conditions more days, it would imply more damage in terms of water availability 			
Sampling strategies reported?	Yes	Household questionnaire surveys and participatory rural appraisal (PRA) were conducted in all the five villages in order to quantify each of these indicators. A total of 150 households (30 households in each village) were randomly selected across the villages for the household questionnaire survey.			
Sampling sizes reported?	Yes	Household questionnaire surveys and participatory rural appraisal (PRA) were conducted in all the five villages in order to quantify each of these indicators. A total of 150 households (30 households in each village) were randomly selected across the villages for the household questionnaire survey.			
Data analysis methods reported?	No	The construct exposure is only operationalized up to the point of data collection. Afterwards, data is analyzed according to a conceptual framework in which this construct is not included.			
Conclusion					
Transparency Conclusion:	No				

Structured summary of operationalization – transparency assessment					
Construct: Exposure					
Article: Jamir et al (2013)					
Criterion	Assessment	Quoted text or Rationale for negative assessment			
Construct defined?	Yes/no				
Data collection methods reported?	Yes	Household questionnaire surveys and participatory rural			
		appraisal (PRA) were conducted in all the five villages in			

F	T				
		-	ify each of these		
) households in		
			-		ld questionnaire
				-	oup discussions
					discussions with
		the community	, village counci	l members an	d district offi-
		cials gave an ir	isight into the lo	ocal problems	
		[]			
		Based on the r	esponse of the f	farmers and t	he village
		council membe	ers during house	ehold surveys	and PRA, the
		mean, minimu	m and maximur	n values for e	ach of the
		indicators wer	e obtained. Seco	ondary data w	vere used for
		those indicato	rs that could not	t be quantifie	d by this
		approach.			
Reporting of indicators/questions	Yes	Table 2 Descrip	otion and ration	ale for indicat	ors selected for
used to operationalise construct?		the vulnerabili	ty assessment		
		Component	Indicator	Indicator	Rationale
		indicators	description	units	
		Extreme	Number of	Number	The
		climate	years		indicator is
		events	experiencing		used to
			rainfall		represent
			deficit or		the existing
			droughts		exposure
			taken as a		level to
			proxy		climate
					variability
		Drought	Total	Months	If the
		duration	amount of		drought-like
			time the		conditions
			drought-like		persist for
			conditions		more days,
			persist in		it would
			the village		imply more
					damage in
					terms of
					water
					availability
		11			for drinking
		11			purposes
					and
					irrigation
		Extent of	Ratio of the	Number	One of the
		dryland	dryland area		most
			or non-		limiting
			irrigated		natural
		11	agricultural		resources in
		11	land to the		drylands is
			total		water, and
			geographical		therefore
		11	area of the		any form of
		11	village		disruption

Transparency Conclusion:	No	
<u>Conclusion</u>		
Data analysis methods reported?	No	The construct exposure is only operationalized up to the point of data collection. Afterwards, data is analyzed according to a conceptual framework in which this construct is not included.
Sampling sizes reported?	Yes	Household questionnaire surveys and participatory rural appraisal (PRA) were conducted in all the five villages in order to quantify each of these indicators. A total of 150 households (30 households in each village) were randomly selected across the villages for the household questionnaire survey.
Sampling strategies reported?	Yes	Household questionnaire surveys and participatory rural appraisal (PRA) were conducted in all the five villages in order to quantify each of these indicators. A total of 150 households (30 households in each village) were randomly selected across the villages for the household questionnaire survey.
		in the normal rainfall pattern or water availability can trigger drought-like conditions. The higher the extent of drylands,

Structured summary of ope	ructured summary of operationalization – transparency assessment					
Construct: Sensitivity						
Article: Jamir et al (2013)						
<u>Criterion</u>	Assessment	Quoted text or Rationale for negative assessment				
Construct defined?	Yes/no					
Data collection methods reported?	Yes	Household questionnaire surveys and participatory rural appraisal (PRA) were conducted in all the five villages in order to quantify each of these indicators. A total of 150 households (30 households in each village) were randomly selected across the villages for the household questionnaire survey. The PRA was in the form of focus group discussions and semi-structured interviews. The group discussions with the community, village council members and district offi- cials gave an insight into the local problems. [] Based on the response of the farmers and the village council members during household surveys and PRA, the mean,				

		minimum and	maximum value	s for each of t	he indicators were
					se indicators that could
			ed by this appro		
Reporting of	Yes				ors selected for the
indicators/questions used		vulnerability as			
to operationalise		Component	Indicator	Indicator	Rationale
construct?		indicators	description	units	
		Area under	Total area	Area (ha/	Due to increasing
		shifting	under	acre/local	requirement for
		cultivation	shifting	unit)	cultivation of land in
			cultivation	,	Northeast India, the
			with less		fallow period in a
			fallow		shifting cultivation
			periods (2–4		cycle has reduced
			years)		from 20–30 to 2–3
					years. This has
					adverse impacts on
					the ecosystem, and
					the land is
					increasingly
					deteriorating. Also,
					during the 'slashing
					and burning, cycle,
					the forests emit
					carbon dioxide
					which can prove
					quite harmful in the
					long run unless the
					lost forests are
					replaced through
					plantation activities.
					Only that area under
					shifting cultivation
					has been considered
					where the fallow
					periods are less (2–4
					years). The rationale
					for taking this is
					because the
					shortened fallow
					does not allow the
					recovery of nutrients
					necessary for crop
					production, and this
					intensification is
					causing shifting
					cultivation to
					become
					unsustainable. The
					net result is an
					increase in degraded
					lands that support
					neither crops nor

Total area under rainfed agricultureThe total area cultivated by unit)Area (ha/ Greater the area under rainfed crops, greater is the dependence on rainfall. Hence, any change in rainfall directly on rainfall for irrigation (whether under settled or shifting cultivation)Area (ha/ acre/ local influence the crop production thereby increasing the vulnerabilityTotal area under settled or shifting cultivation)Area (ha/ acre/ local unit)Greater the area under rainfall. Hence, any change in rainfall pattern would influence the crop production thereby increasing the vulnerabilityTotal area under settled or shifting cultivation)Area (ha/ acre/ local unit)More the area under irrigated crops, lesser the dependence on rainfall for inrigated area under unit)More the area under irrigated crops, lesser the dependence on rainfall for irrigated crops, lesser the dependence on rainfall for irrigated area under unit)
Image: constraint of the state is the sta
under rainfed agriculturearea cultivated by unit)acre/local unit)under rainfed crops, greater is the dependence on rainfall. Hence, any change in rainfall pattern would influence the crop production thereby (whether under settled or shifting cultivation)under rainfed crops, greater is the dependence on rainfall. Hence, any change in rainfall pattern would influence the crop production thereby increasing the vulnerabilityTotal area under irrigated irrigatedThe total agricultureArea (ha/ acre/ local unit)More the area under irrigated crops, lesser the dependence on rainfall for
under rainfed agriculturearea cultivated by unit)acre/local unit)under rainfed crops, greater is the dependence on rainfall. Hence, any change in rainfall pattern would influence the crop production thereby (whether under settled or shifting cultivation)under rainfed crops, greater is the dependence on rainfall. Hence, any change in rainfall pattern would influence the crop production thereby increasing the vulnerabilityTotal area under irrigated irrigatedThe total agricultureArea (ha/ acre/ local unit)More the area under irrigated crops, lesser the dependence on rainfall for
rainfed agriculturecultivated by the farmers, which isunit)greater is the dependence on rainfall. Hence, any change in rainfall pattern would influence the crop production thereby (whether under shifting cultivation)unit)greater is the dependence on rainfall. Hence, any change in rainfall pattern would influence the crop production thereby increasing the vulnerabilityTotal area under irrigated cropsTotal area area under irrigatedArea (ha/ acre/ local unit)More the area under irrigated crops, lesser the dependence on rainfall for
agriculturethe farmers, which is dependent directly on rainfall for irrigation (whether under settled or shifting cultivation)dependence on rainfall. Hence, any change in rainfall pattern would influence the crop production thereby increasing the vulnerabilityTotal area under irrigated cropsArea (ha/ acre/ local unit)More the area under irrigated crops, lesser the dependence on rainfall for
which is rainfall. Hence, any change in rainfall directly on rainfall for influence the crop production thereby increasing the under vulnerability settled or shifting cultivation) Total area The total agriculture agriculture area under irrigated area under unit) lesser the dependence on rainfall for irrigated for shifting crops manually irrigated for area for the area under rainfall for irrigated for area under unit) dependence on rainfall for influence the crop production thereby increasing the vulnerability increasing the vulnerab
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irrigation (whether under settled or shifting cultivation)production thereby increasing the vulnerabilityTotal area under shifting cultivation)Area (ha/ acre/ local irrigated crops, lesser the dependence on rainfall for
(whether under settled or shifting cultivation)increasing the vulnerabilityTotal area under shifting cultivation)Area (ha/ acre/ local irrigated crops, lesser the dependence on rainfall for
under settled or shifting cultivation)vulnerabilityTotal area under agriculture irrigated cropsArea (ha/ acre/ local irrigated irrigated manually irrigatedMore the area under irrigated crops, lesser the dependence on rainfall for
settled or shifting cultivation)settled or shifting cultivation)Area (ha/More the area underTotal area under irrigated cropsThe total agriculture acre/ local unit)Area (ha/More the area underIrrigated irrigated irrigated irrigatedarea under unit)Unit)Iesser the dependence on rainfall for
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cultivation)cultivation)Total areaThe totalArea (ha/More the area underunderagricultureacre/ localirrigated crops,irrigatedarea underunit)lesser thecropsmanuallydependence onirrigatedirrigatedrainfall for
Total areaThe totalArea (ha/More the area underunderagricultureacre/ localirrigated crops,irrigatedarea underunit)lesser thecropsmanuallyirrigatedrainfall for
under irrigated cropsagriculture area under manually irrigatedacre/ local unit)irrigated crops, lesser the dependence on rainfall for
irrigated area under unit) lesser the crops manually dependence on irrigated rainfall for
crops manually dependence on irrigated rainfall for
irrigated rainfall for
crops agricultural
(during activities—it is
kharif as assumed that
well as rabi irrigated crops are
seasons) not directly
dependant on
rainfall variability or
much affected by
drought
Irrigation Total Days/year This indicator
availability number of determines whether
days enough water
irrigation (whether
available per groundwater/surface
year water) is available
for the irrigated
crops. Lesser
number of days for
which irrigation
water is available would indicate a
would indicate a water stress
situation for the
village
Average The inverse Number This gives an
crop of (the estimate whether
diversity number of mono-cropping is
index crops grown practiced or the
by a farmer grows
household multiple crops. In a

-			
	?1)		climate change
			scenario, multi-
			cropping is
			preferable
Total	Total	Number	Kharif crops are
number of	number of		grown with the
kharif crops	crops grown		onset of monsoon/
grown	during kharif		rainfall season, and
	or rainfed		these are harvested
	season of		during September-
	the year		October. Examples
			include paddy,
			soyabean. Since
			these crops are
			mostly rainfall
			dependent, any
			change in the rainfall
			pattern (deficit) is
			likely to affect Kharif
			crop yield and
			production
Total	Total	Number	Rabi crops are
number of	number of		mostly winter crops
rabi crops	crops grown		sown during
grown	during rabi		October–December
0	and zaid		and harvested
	seasons of		during April.
	the year		Examples are wheat,
	(non-major		gram, peas. Growing
	cropping		more of rabi crops is
	seasons)		an alternative way to
			minimize crop
			production losses
			due to erratic rainfall
			pattern
Rural	Total rural	Percentage	Higher the rural
population	population	reitentage	population density
density	of the village		within a region,
uchisity	divided by		greater will be the
	the		exposure to climate
	geographical		variability and
	area of the		change
	village		change
Dorcontago	Percentage	Percentage	The more is the
Percentage of small-	of small-	Percentage	number of small land
scale	scale		holdings, higher the
farmers	farmers		risk of damage to
	(with land		extreme events and
	holding		subsequent losses
	between 1.0		
	and 1.99 ha)		
Percentage	Percentage	Percentage	The more is the

reported?appraisal (PRA) were conducted in all the five villages in order to quantify each of these indicators. A total of 150 households (30 households in each village) were randomly selected across the villages for the household questionnaire survey.Sampling sizes reported?YesHousehold questionnaire surveys and participatory rural appraisal (PRA) were conducted in all the five villages in order to quantify each of these indicators. A total of 150 households (30 household in all the five villages in order to quantify each of these indicators. A total of 150 households (30 households in each village) were randomly selected across the villages for the household questionnaire survey.Data analysis methods reported?NoThe construct sensitivity is only operationalized up to the point of data collection. Afterwards, data is analyzed according to a conceptual framework in which this construct is not included.ConclusionExamples				-			
Sampling strategies reported?YesHousehold questionnaire surveys and participatory rural appraisal (PRA) were conducted in all the five villages in order to quantify each of these indicators. A total of 150 households (30 households in each village) were randomly selected across the villages for the household questionnaire survey.YesHousehold questionnaire surveys and participatory rural appraisal (PRA) were conducted in all the five villages in order to quantify each of these indicators. A total of 150 households (30 households in each village) were randomly selected across the villages for the household questionnaire survey.Data analysis methods reported?NoThe construct sensitivity is only operationalized up to the point of data collection. Afterwards, data is analyzed according to a conceptual framework in which this construct is not included.			-	-		-	
Image: Second			farmers				
Crop area affectedTotal area under under affected by droughtsArea (ha/ acre/local unit)More croplands affected by droughts would imply higher damage and losses in terms of agricultural produceValue of crops lostThe type and amount of crop sown and its market price during the time of crop loss taken as proxyINR Loss of agricultural produce due to droughts would mean reduction in farm income and higher vulnerability of the farmerSampling strategies reported?YesHousehold questionnaire surveys and participatory rural appraisal (PRA) were conducted in all the five villages in order to quantify each of these indicators. A total of 150 households (30 households in each village) were randomly selected across the villages for the household questionnaire surveys and participatory rural appraisal (PRA) were conducted in all the five villages in order to quantify each of these indicators. A total of 150 households (30 households in each village) were randomly selected across the villages for the household questionnaire survey.Data analysis methods reported?NoThe construct sensitivity is only operationalized up to the point of data collection. Afterwards, data is analyzed according to a conceptual framework in which this construct is not included. Conclusion				•		the risk of damage to	
Crop area affectedTotal area under cultivation affected by droughtsArea (ha/ acre/local unit)More croplands affected by droughts would imply higher damage and losses in terms of agricultural produceValue of crops lostThe type and amount of crop sown and its market price during the time of crop loss taken as proxyINRLoss of agricultural produce due to droughts would mean reduction in farm income and higher vulnerability of the farmerSampling strategies reported?YesHousehold questionnaire surveys and participatory rural appraisal (PRA) were conducted in all the five villages in order to quantify each of these indicators. A total of 150 households (30 households in each village) were randomly selected across the villages for the household questionnaire surveys and participatory rural appraisal (PRA) were conducted in all the five villages in order to quantify each of these indicators. A total of 150 households (30 households in each village) were randomly selected across the villages for the household questionnaire survey.Sampling sizes reported?YesHousehold questionnaire surveys and participatory rural appraisal (PRA) were conducted in all the five villages in order to quantify each of these indicators. A total of 150 households (30 households in each village) were randomly selected across the villages for the household questionnaire survey.Data analysis methods reported?NoThe construct sensitivity is only operationalized up to the point of data collection. Afterwards, data is analyzed according to a conceptual framework in which this construct is not included.ConclusionConclusion				holding\1ha)		extreme events and	
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reported? data collection. Afterwards, data is analyzed according to a conceptual framework in which this construct is not included. <u>Conclusion</u>	Data analysis methods	No	The construct	sensitivity is onl	y operationaliz	ed up to the point of	
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			conceptual fra	<u>mework in w</u> hic	h this construct	t is not included.	
Transparency Conclusion: No	Conclusion						
	Transparency Conclusion:	No					

Structured summary of operationalization – transparency assessment				
Construct: Adaptive Capacity				
Article: Marshall				
<u>Criterion</u>	<u>Assessme</u> <u>nt</u>	Quoted text or Rationale for negative assessment		
Construct defined?	Yes	It refers to the ability of individuals or communities to adapt to adversity and stressful life-events by 'reorganising' through networks or institutions that learn, store knowledge and experi- ence and are creative, flexible and novel in their approach to problem solving (Vayda and McCay, 1975; McCay, 1981; Sonn and Fisher, 1998).		
Data collection methods reported?	Yes	Survey questions were developed so as to quantify a grazier 's capacity to adapt to climate variability, their level of dependency		

		on the resource and their likely uptake of seasonal climate forecasts (Marshall, 2008).
Reporting of indicators/questions	No	"Some questions within the survey, such
used to operationalise construct?	NO	as 'in what year were you born?', required simple
		answers. Some
		questions such as, 'are you employed as a land manager on
		someone else's land?' required a 'yes' or 'no'
		answer. Answers to
		most questions, however, were expressed as a statement
		and
		reflected an attitude, opinion or stance. For example, one
		statement was, ''I do not talk about strategies to survive
		drought much with others''. Respondents were asked to
		rate how strongly
		they agreed with each statement using a 4-point rating scale
		(1 = strongly disagree, 2 = disagree, 3 = agree, 4 = strongly
		agree).
		This scale builds upon the Likert scale (Mueller, 1986;
		Likert, 1932)
		and is especially useful in quantifying and comparing attitudes,"
	Vaa	- Insufficient reporting of survey questions.
Sampling strategies reported?	Yes	2.2. Study site selection
		In the Australian rangelands drought is a 'normal'
		characteristic
		for cattle producers (or graziers). In Queensland, for
		example,
		drought was declared 15 times between 1965 and 1989 and in
		some parts (e.g. the Burdekin region) drought can be a
		continual
		state for up to 34% of time (McKeon et al., 2000; Johnston et
		al.,
		2000). The survey, in this study, was conducted in the Upper
		Burdekin dry tropics region which is located in north
		eastern
		Queensland and covers an area of about 36,000 km2 (see
		Fig. 1). It is
		a sub-catchment of the Burdekin River, one of the largest
		rivers in
		the state. The high rainfall variability of the region is
		strongly
		correlated ahead of time with relatively well understood
		aspects of
		ENSO, making forecasting relatively beneficial for those who
		choose to use it (Ash et al., 2007). The climate is
		characterised by
	1	pronounced wet and dry seasons, with most rain falling
		between
		November and April. Average rainfall ranges between 650
		and
		1500 mm annually (Stokes et al., 2006). Other than some
		basalt
		soils, most soils in the region have low levels of nitrogen,

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		organic
		matter and fertility (Stokes et al., 2006).
		2.4. Survey administration
		An intensive media campaign commenced the survey
		administration
		phase to introduce the research to the region. Next,
		names, addresses and telephone numbers of graziers were
		obtained from the yellow pages; an online business
		directory.
		All grazing families with the Dalrymple Shire received a
		personal
		letter informing them of the research and inviting them to
		participate.
		The final version of the survey was administered to 100
		graziers
		in their homes by two interviewers working as a team
		between
		March 2007 and June 2007.
Sampling sizes reported?	Yes	The final version of the survey was administered to 100
		graziers
		in their homes
		[]
		Of the 103 families that were contacted, 100 agreed to
		participate in the research. Hence a
		response rate of 97% was achieved for the study. There are
		around
		120-130 grazing families that live and work on the 230
		properties
		within the region (many properties are owned by the same
		grazing
		family) so that results from this study represent at least 77%
		of the
		region (Greiner et al., 2003).
Data analysis methods reported?	Yes	Quantitative data were analysed using standard statistical
		techniques (using SPSS1). Responses to each survey
		question are
		described in the text and the overall resilience to climate
		variability on all four dimensions is presented as a mean of
		the
		mean responses for each dimension. The influence of
		resource
		dependency, and likely uptake on each component of
		adaptive
		capacity was quantified using Pearson correlations. A '
		weighted
		mean' or F-score was calculated for the set of relevant
		statements
		for each component of resource dependency and social
		resilience.
		Pearson correlations were made between uptake and the F-
		scores
		for each conceptual variable. Bonferroni adjustments were
		made to
		offset the chance of a false rejection of the null hypothesis in
	1	

		a large number of separate t-tests.
Conclusion		
Transparency Conclusion:	No	

Structured summary of operationalization – transparency assessment			
Construct: Livelihood assets			
Article: Notenbaert et al (2013)			
<u>Criterion</u>	<u>Assessme</u> <u>nt</u>	Quoted text or Rationale for negative assessment	
Construct defined?	Yes	(Turner et al. 2003).	
Data collection methods reported?	Yes	A detailed household survey was used to elicit household responses (n = 184) about their available resources, live- lihood sources and coping strategies to climate variability.	
Reporting of indicators/questions used to operationalise construct?	No	The text provides the following outline of the survey sections, but does not report the actual questions or indicators: The questionnaire was divided into the following five sections: (1) household composition, livelihood strategies and livestock assets; (2) household livestock ownership, herd dynamics and species; (3) livestock feeding tech- niques, management, products and markets, (4) welfare outcomes (income, food consumption and health) and (5) focused on the main concerns/challenges facing households and their coping strategies. In this last section, households were asked to list and rank their concerns and describe the coping strategies employed to counter these concerns.	
Sampling strategies reported?	No		
Sampling sizes reported?	Yes	household survey was used to elicit household responses (n = 184)	
Data analysis methods reported?	Yes/no	These pieces of information taken all together, allowed us to come up with a household-level vulnerability index, assessing the degree of a household's vulnerability to climate change and variability in relation to other households in the same village. The index is not based on thresholds nor does it represent an absolute value. It is a relative measure, representing the households' own perception of how they have been coping in the past as compared to other households. For each of the concerns a household listed, an impact factor (Ii) was established. This impact factor takes the value of ?1 if the household considered itself coping less well than the other households, -1 if it was doing better and 0 if they assessed themselves similar to the other households in the village. The rationale being that house- holds that are coping less than others, are more vulnerable, while the ones that are doing better than other households have a lower vulnerability. The concerns listed are not all of equal importance. To correct for this, we established a weight for each of the sampled households. If a household reported n concerns, the vulnerability of a household was then calculated following formula below. Formula 1:	

Construct: Livelihoods		
Article: Notenbaert et al (2013)		
Criterion	<u>Assess</u> ment	Quoted text or Rationale for negative assessment
Construct defined?	Yes	(Turner et al. 2003).
Data collection methods reported?	Yes	A detailed household survey was used to elicit household responses (n = 184) about their available resources, live- lihood sources and coping strategies to climate variability.
Reporting of indicators/questions used to operationalise construct?	No	The text provides the following outline of the survey sections, but does not report the actual questions or indicators: The questionnaire was divided into the following five sections: (1) household composition, livelihood strategies and livestock assets; (2) household livestock ownership, herd dynamics and species; (3) livestock feeding tech- niques, management, products and markets, (4) welfare outcomes (income, food consumption and health) and (5) focused on the main concerns/challenges facing households and their coping strategies. In this last section, households were asked to list and rank their concerns and describe the coping strategies employed to counter these concerns.
Sampling strategies reported?	No	
Sampling sizes reported?	Yes	household survey was used to elicit household responses (n = 184)
Data analysis methods reported?	Yes/no	These pieces of information taken all together, allowed us to come up with a household-level vulnerability index, assessing the degree of a household's vulnerability to climate change and variability in relation to other households in the same village. The index is not based on thresholds nor does it represent an absolute value. It is a relative measure, representing the households' own perception of how they have been coping in the past as compared to other households. For each of the concerns a household listed, an impact factor (Ii) was established. This impact factor takes the value of ?1 if the household considered itself coping less well than the other households, -1 if it was doing better and 0 if they assessed themselves similar to the other households in the village. The rationale being that house- holds that are coping less than others, are more vulnerable, while the ones that are doing better than other households have a lower vulnerability. The concerns listed are not all of equal importance. To correct for this, we established a weight for each of the concerns based on the rank they were assigned across all the sampled households. If a household reported n concerns, the vulnerability of a household

	was then calculated following formula below. Formula 1: v ¼X n i¼1 n = number of concerns, wi = weight of concerns, li = impact (?1: worse than/0: same/- 1:better).	
Conclusion		
Transparency Conclusion:	NOT TRANSPARENT	

Structured summary of opera	ationalizat	ion – transparency assessment
Construct: Vulnerability Outco	omes	
Article: Notenbaert et al (201	3)	
<u>Criterion</u>	<u>Assess</u> <u>ment</u>	Quoted text or Rationale for negative assessment
Construct defined?	Yes	the outcomes that describe the loss in well-being (Turner et al. 2003).
Data collection methods reported?	Yes	A detailed household survey was used to elicit household responses (n = 184) about their available resources, live- lihood sources and coping strategies to climate variability.
Reporting of indicators/questions used to operationalise construct?	No	The text provides the following outline of the survey sections, but does not report the actual questions or indicators: The questionnaire was divided into the following five sections: (1) household composition, livelihood strategies and livestock assets; (2) household livestock ownership, herd dynamics and species; (3) livestock feeding tech- niques, management, products and markets, (4) welfare outcomes (income, food consumption and health) and (5) focused on the main concerns/challenges facing households and their coping strategies. In this last section, households were asked to list and rank their concerns and describe the coping strategies employed to counter these concerns.
Sampling strategies reported?	No	
Sampling sizes reported?	Yes	household survey was used to elicit household responses (n = 184)
Data analysis methods reported?	Yes/no	These pieces of information taken all together, allowed us to come up with a household-level vulnerability index, assessing the degree of a household's vulnerability to climate change and variability in relation to other households in the same village. The index is not based on thresholds nor does it represent an absolute value. It is a relative measure, representing the households' own perception of how they have been coping in the past as compared to other households. For each of the concerns a household listed, an impact factor (Ii) was established. This impact factor takes the value of ?1 if the household considered itself coping less well than the other households, -1 if it was doing better and 0 if they assessed themselves similar to the other households in the village. The rationale being that house- holds that are coping less than others, are more vulnerable, while the ones that are doing better than other households have a lower vulnerability. The concerns listed are not all of equal importance. To correct for this, we established a weight for each of the concerns based on the rank they were assigned across all the sampled households. If a household reported n concerns, the vulnerability of a household was then calculated following formula below. Formula 1: v ¼X n i¼1

	n = number of concerns, wi = weight of concerns, li = impact (?1: worse than/0: same/- 1:better).	
Conclusion		
Transparency Conclusion:	NOT TRANSPARENT	

Structured summary of ope	erationalizat	ion – transparency assessment
Construct: factors influenci	ng resilience	and vulnerability
Article: Sallu et al		
<u>Criterion</u>	<u>Assessm</u>	Quoted text or Rationale for negative assessment
	<u>ent</u>	
Construct defined?	Yes	Through comparative research we provide a rich contextual narrative and use it to explore those factors that in isolation and combination push livelihoods along particular "trajectories" towards vulnerability or resilience.
Data collection methods reported?	Yes	Methods used included oral histories and in-depth livelihood trajectory mapping exercises (n = 17), as well as household-level livelihood and resource use surveys (n = 98). These sought to identify the ways in which households use their environment, how environmental changes (drought, land degradation, etc.) affect livelihood decisions, and how environmental factors interact with broader socioeconomic and political processes to determine resource use outcomes and impacts on livelihood systems.
Reporting of indicators/questions used to operationalise construct?	No	"These sought to identify the ways in which households use their environment, how environmental changes (drought, land degradation, etc.) affect livelihood decisions, and how environmental factors interact with broader socioeconomic and political processes to determine resource use outcomes and impacts on livelihood systems." – Insufficient documentation of household surveys
Sampling strategies reported?	Yes	Data were collected in 2004 and 2005 when fieldwork was carried out as part of a larger research project that considered environmental, socioeconomic, and institutional dynamics in two of Botswana's remote rural settlements, Khawa and Kedia settlements in Central and Kgalagadi Districts, respectively (Fig. 1). These settlements were chosen for comparison because they were of similarly low economic status and were classified by the government as "remote area dweller" settlements, yet were representative of distinct social-ecological systems with different environmental contexts, social compositions, and histories.
Sampling sizes reported?	Yes	in two of Botswana's

		remote rural settlements,
		[]
		A mixed-method approach was taken in collecting
		the data. Methods used included oral histories and
		in-depth livelihood trajectory mapping exercises (n
		= 17), as well as household-level livelihood and
		resource use surveys (n = 98).
Data analysis methods	Yes	Data analysis was conducted throughout the period
reported?		of information gathering. Initially, this was at a
		descriptive level in order to note any trends in the
		data, but it progressed to a more detailed level as
		both qualitative and quantitative social and
		environmental information was drawn together.
		Qualitative data were coded through processes of
		indexing the data under emerging themes. This
		permitted the identification of the factors that played
		an important role in the construction of livelihood
		strategies. Consistent triangulation of the results
		highlighted any contradictions and similarities in
		the different data sources. Where contradictions
		were found, further iterative reflection took place
		in the form of focus groups in order to ascertain why
		and how the conflicts in information may have
		occurred. This became a circular process that led to
		inductive interpretation and explanation as the
		ecological information was gradually juxtaposed
		within the emergent socioeconomic context.
<u>Conclusion</u>		· · ·
Transparency Conclusion:		no

Structured summary of ope	erationalizat	ion – transparency assessment
Construct: livelihood trajec	tories	
Article: Sallu et al		
<u>Criterion</u>	<u>Assessm</u>	Quoted text or Rationale for negative assessment
	<u>ent</u>	
Construct defined?	Yes	Bagchi et al. (1998) use the term "livelihood trajectories" to describe and explain the direction and pattern of livelihoods of individuals or groups of people (e.g., households). A livelihood trajectory approach allows the examination of an individual household's "strategic behavior that is embedded in a historical repertoire, in social differentiation" (de Haan and Zoomers 2005), and in perceptions of risk. Such an approach is sensitive to life histories (an individual's own "story" of their changing livelihoods).
Data collection methods reported?	Yes/no	Methods used included oral histories and in-depth livelihood trajectory mapping exercises (n = 17), as well as household-level livelihood and resource use surveys (n = 98). These sought to identify the ways in which households use their environment, how environmental changes (drought,

		land degradation, etc.) affect livelihood decisions, and how environmental
		factors interact with broader
		socioeconomic and political processes to determine
		resource use outcomes and impacts on livelihood
		systems.
Reporting of	No	"These sought to
indicators/questions used		identify the ways in which households use their
to operationalise		environment, how environmental changes (drought,
construct?		land degradation, etc.) affect livelihood decisions, and how environmental factors interact with broader
		socioeconomic and political processes to determine
		resource use outcomes and impacts on livelihood
		systems."
		 Insufficient documentation of household surveys and livelihood
		trajectory mapping exercise
Sampling strategies	Yes	Data were collected in 2004 and 2005 when
reported?		fieldwork was carried out as part of a larger research
		project that considered environmental, socioeconomic,
		and institutional dynamics in two of Botswana's
		remote rural settlements, Khawa and Kedia
		settlements in Central and Kgalagadi Districts,
		respectively (Fig. 1). These settlements were chosen
		for comparison because they were of similarly low
		economic status and were classified by the government as "remote area
		dweller" settlements,
		yet were representative of distinct social-ecological
		systems with different environmental contexts,
		social compositions, and histories.
Sampling sizes reported?	Yes	in two of Botswana's
Sampling sizes reported:	163	remote rural settlements,
		[]
		A mixed-method approach was taken in collecting
		the data. Methods used included oral histories and
		in-depth livelihood trajectory mapping exercises (n
		= 17), as well as household-level livelihood and
		resource use surveys (n = 98).
Data analysis methods	Yes	Data analysis was conducted throughout the period
reported?		of information gathering. Initially, this was at a
		descriptive level in order to note any trends in the
		data, but it progressed to a more detailed level as
		both qualitative and quantitative social and
		environmental information was drawn together.
		Qualitative data were coded through processes of
		indexing the data under emerging themes. This
		permitted the identification of the factors that played
		an important role in the construction of livelihood
		strategies. Consistent triangulation of the results
		highlighted any contradictions and similarities in
		the different data sources. Where contradictions
		were found, further iterative reflection took place
		in the form of focus groups in order to ascertain why
		and how the conflicts in information may have

Conclusion	occurred. This became a circular process that led to inductive interpretation and explanation as the ecological information was gradually juxtaposed within the emergent socioeconomic context.
Transparency Conclusion:	no

Structured sumn	nary of operat	ionalization – tra	ansparency assessment
Construct: Sensit			
Article: Baca et a	l (2004)		
<u>Criterion</u>	<u>Assessmen</u>	Quoted text or	Rationale for negative assessment
_	<u>t</u>		
Construct	Yes		measure of how systems could be affected by the change in climate
defined?			n crop yields change or how much human health might be affected).
Data collection	Yes		were used to assess the vulnerability of coffee
methods			ountry. From a population of 7,000 farmer members from 15
reported?			cross the four countries, 558 farmers were interviewed.
Reporting of	Inconclusiv		re then constructed to evaluate each indicator as
indicators/ques tions used to	e – info to		S1 in File S1. To quantify the parameters scales from 1 to 5 were
	be		nary scale of 0 and 1, depending on the nature of the parameter.
operationalise construct?	requested from		s for each indicator were calculated by averaging all the parameters formed to a 0-1 continuous variable scale, with 0 being low and 1
construct!	authors		sitivity and adaptive capacity.
	autions	[]	
		Indicator	Parameter
		Conservatio	Area of forest around the water source
		n	
			Area of forest to keep in the farm
		Soil and	Soil type
		fertility	
			Soil slope
			Mulch of leaves
			Soil depth
		Access to	Source of water for drinking or postharvest processing
		and	
		availability	
		of water	
			Availability of water during the year
			Distance to the water source
			Water quality
		Variability	Average farm yield in four years compared to the local average
		of annual	
		coffee	
		production	Time from the form to the collection conton
		Road type	Time from the farm to the collection center
			Time from the farm to the nearest market Type of road from the farm to the collection center or nearest market
		Transport of	Type of transportation from the farm to the market
		products	rype of transportation from the farm to the fild Ket
		products	Time from the farm to the bus stop
		Housing	Housing material
	1	indusing	

		quality Bas	sic services	
			mber of symptoms of human disease	
		food		
			mber of times that person is attended by a doctor	
			pendency of external products	
			pe and time	
Sampling	Yes		of 7,000 farmer members from 15 organizations across the four	
strategies			ers were interviewed. The farmers may be considered	
reported?		representative of sr	mall-scale organized farmers, but should not be considered	
		representative of th	ne coffee farmers as a whole in each country. The sample size	
		was defined using t	he formula for finite populations [20] and then individual	
		farmers were select	ted randomly, stratified according to exposure level and	
		country by 2050 (Ta	able 1).	
Sampling sizes	Yes		of 7,000 farmer members from 15 organizations across the four	
reported?		countries, 558 farm	iers were interviewed.	
Data analysis	Yes	A cluster analysis w	as carried out for each indicator of sensitivity	
methods		and adaptive capac	ity based on the score of each family using the Ward method	
reported?			ance. Then an Analysis of Variance (ANOVA) was applied using	
•			to compare the averages for each indicator by cluster. The	
			luster that obtained significantly different sample averages	
			nree levels on a scale of 0 to 1 (0–0.33=low, 0.34–0.66=medium,	
			ers with the greatest number of indicators with high, medium	
			re classified as having high, medium or low sensitivity and	
		-	21]. Each factor (exposure, sensitivity and adaptive capacity), as	
			d, and was classified into three levels (high, medium, low). To	
			rability equation we assigned each level a quantitative value:	
			high=3. With three factors and three levels per factor, we	
			e combinations. After applying the equation we obtained 7	
			,5), which we used to define low $(-1,0)$, medium $(1,2,3)$ and	
			vulnerability (Figure 1). A Principal Components Analysis (PCA)	
			dentify the indicators that most contribute to the sensitivity or	
Conclusion	1	auaptive capacity 0	f families in different municipalities.	
Conclusion	lin oo n oluur i'ur	e nevetie nelizeti	info to be requested from outboxs	
Transparency	inconclusive	operationalization – I	info to be requested from authors.	
Conclusion:				

Structured summary	Structured summary of operationalization – transparency assessment		
Construct: Adaptive C	apacity		
Article: CARE (2009)			
<u>Criterion</u>	<u>Assess</u> ment	Quoted text or Rationale for negative assessment	
Construct defined?	Yes	The ability of a system to adjust to climate change (including climate variability and extremes) to moderate potential damages, to take advantage of opportunities, or to cope with the consequences.6	
Data collection methods reported?	Yes	Secondary Research An understanding of the livelihoods strategies, socio- economic situation, power dynamics and local governance in the target communities is critical to ensuring that facilitators are effective during the field work, and to identifying focus groups within the community.	

[]	
	Secondary sources for community-level information would include:
	Assessment reports from NGOs or UN organizations Such at the standard second
	• Evaluations of past disaster response operations
	Vulnerability monitoring programs (e.g. Famine Early Warning
	System (FEWS-Net)
	Environmental screening reports for the target area
	Government documents including poverty reduction strategies,
	development plans, official statistics, etc.
	Consultation with agencies (governmental and non-governmental)
	working in the target area
	Seasonal forecasts
	[]
	Policy Analysis
	Depending on the degree of decentralization of decision-making in a particular
	country, local-level plans or policies may be important in shaping adaptive
	capacity of vulnerable households and individuals. Regional or district plans
	and/or sector strategies can give helpful information on priorities of local
	governments. Further, the process for developing these policies and strategies
	can provide insights into the level of participation of vulnerable people in
	establishing these priorities. The status of implementation can yield useful
	information on resource and capacity constraints faced by local actors.
	[]
	Institutional Mapping
	Institutions play a critical role in supporting or constraining people's capacity to
	adapt to climate change. In order to better understand which institutions are
	most important to people in the target communities, an institutional mapping
	exercise is useful. Institutional mapping involves examination of the following
	questions:
	 Which organizations (governmental, non-governmental and •
	community-based) are involved in addressing key issues and problems related to
	climate change? What do they do?
	• Where do they work?
	• How do they interact with the target population? • Where are the overlaps
	with other organizations? • Where are the gaps in capacity?
	• How might some organizations impede the work of others? • What are their
	longer term plans for working in the area? • What are the strengths and
	weaknesses of the institutions?13
	• What is the institution's level of influence over planning and implementation of
	adaptation?
	The mapping exercise assists in identifying the institutions that should be
	engaged in the CVCA process, as well as potential allies and opponents in
	addressing vulnerability at the community level.
	Key Informant Interviews
	Key informants can provide useful insights into local governance structures and
	status of implementation of local policies and programs. Power issues within and
	between communities and other stakeholders can also be surfaced through
	interviews with key actors. Again preserving their anonymity may allow them to
	speak more freely.
	Key informants at the local government/community level would include: Local
	leaders (chiefs, mayors, elected representatives, etc.)
	••
	Representatives of community-based organizations (CBOs) such as farmer's
	groups, water and sanitation committees, savings and credit groups, etc.

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		Representatives of women's groups or other rights-based groups Representatives of NGOs working on programs or advocacy in the target area • Academic/research institutions engaged in the target area [] Secondary Research In order to effectively plan the field work and to ensure that communities are not over-burdened with research and assessment teams, it is important to review existing information. Sources of information on livelihoods would include: Assessment reports from NGOs or UN organizations Project/program baseline studies and/or evaluation reports
		 Vulnerability monitoring programs (e.g. Famine Early Warning System (FEWS-Net)) • Post-disaster assessments Consultation with agencies (governmental and non-governmental) working in the target area • Maps showing topography, agro-ecological regions, infrastructure, etc. In some cases, it will be possible to answer many guiding questions using secondary sources, however this information must be verified by local stakeholders. Having more background information can allow the field work to focus specifically on climate change issues. In many cases, very little information may exist at the household/individual level, and so a deeper participatory analysis will be required to understand the dynamics of vulnerability. Participatory Tools Secondary research is complemented by collaborative learning employing typical participatory tools and discussions in focus groups (FGs). FGs usually involve 5 – 12 people selected to be representative of different livelihood systems and/or vulnerable groups in the community. A single FG can include people selected by age and gender (e.g. teenage girls, or elderly women, or young married men), or by some other common characteristic (e.g. people with chronic illnesses, or members of farmer associations). At a minimum, it is suggested to conduct discussions with groups of men and women separately so that participatory tools are designed to draw out issues which can then be examined further through semi-structured discussion. This is meant only as a guide; the field work must be tailored to the particupatory processes, and balancing learning with information-gathering, relies on strong, thoughtful facilitation. The Field Guides at the end of this Handbook provide facilitation tips as well as
Reporting of	Yes	detailed guidance on using participatory tools and facilitating discussions with focus groups. Guiding Questions Local Government/Community Level
indicators/questions used to operationalise construct?		Capacity Development - What institutions (governmental and non-governmental) are involved in research, planning and implementation of adaptation? What are the most important institutions in facilitating or constraining adaptation? - Do local institutions (governmental and non-governmental) have capacity to monitor and analyze information on current and future climate risks? Are mechanisms in
		 place to disseminate this information? Do local institutions have capacity to plan and implement adaptation activities? Are resources allocated for implementation of adaptation-related policies?

		What is the budget? Where are the resources coming from? What are the existing capacity and
		resource needs and/or gaps for climate change adaptation? - What new
		capacities may be needed to address changing circumstances due to climate
		change?
		Addressing
		Underlying Causes of Vulnerability
		- What social groups within the community are most vulnerable to climate
		change? - Are local planning processes participatory?
		 Do women and other marginalized groups have a voice in local planning processes? Do local policies provide access to and control over critical
		livelihoods resources for all? - What are the other factors constraining adaptive
		capacity of the most vulnerable groups? Do
		vulnerable communities and groups have any influence over these factors?
		[]
		Guiding Questions Household/Individual Level
		Capacity Development
		Are social and economic safety nets available to households?
		- Are financial services available to households?
		- Do people have knowledge and skills to employ adaptation strategies? - Do
		people have access to seasonal forecasts and other climate information?
		Addressing
		Underlying Causes of Vulnerability - Are men and women working together to address challenges? - Do households
		have control over critical livelihoods resources?
		- Do women and other marginalized groups have equal access to information,
		skills and services? - Do women and other marginalized groups have equal rights
		and access to resources? - Are there other social, political or economic factors
		which make particular people within the
		-
		community more vulnerable than others? Do these vulnerable groups have any
Sampling strategies	Inronoc	influence over these factors?
Sampling strategies reported?	(propos ed	
	metho	
	dology)	
Sampling sizes	(propos	
reported?	ed	
	metho	
	dology)	
Data analysis	Yes	Compiling and Analyzing the Data
methods reported?		After completing the field work, the teams should review the information
		gathered to identify any gaps in the information collected. Follow-up interviews or further research may be required to fill gaps.
		Field teams from the same community should then sit together to analyze the
		information gained. Comparing the results for different groups within the
		community is an important part of the process, as this yields insights on
		differential vulnerability. The analysis may expose inequalities within the
		community which may not have been previously recognized. Follow-up
		discussions or interviews with particularly vulnerable groups may be needed to
		fully understand community or household dynamics.
		Once information for specific communities has been analyzed, it can be helpful

	for teams who worked in different communities to come together to identify trends, common issues, differences, and to evaluate the process. The community information should then be combined with the information gained using other tools in order to answer the guiding questions. Validating the Analysis After preliminary analysis of the data has been completed, a presentation of the findings should be made to community representatives to confirm the validity of
	the conclusions. A two-step approach is suggested for the validation process. The first step would be to present the analysis to the community focus groups themselves to ensure that the conclusions drawn are correct. Next, it is recommended that the results are presented to a wider community group and local organizations to facilitate dialogue on issues that have been raised by particular groups which may have implications for other groups. In particular, this provides an opportunity to make other groups in the community aware of the views of particularly vulnerable groups. Note that there may be sensitivities around some of the issues raised by different groups, and facilitators must be prepared to resolve conflicts that may arise. It must also be ensured that the sharing of views does not yield negative consequences for any members of the community. Local actions can provide guidance on this.
	Feedback from stakeholders should be incorporated into the final analysis.
Conclusion	
Transparency Conclusion:	Partial

Structured summary of operationalization – transparency assessment			
Construct: Hazard			
Article: CARE (2009)			
<u>Criterion</u>	<u>Assess</u> <u>ment</u>	Quoted text or Rationale for negative assessment	
Construct defined?	Yes	A dangerous phenomenon, substance, human activity or condition that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage.9	
Data collection methods reported?	Yes	Secondary Research An understanding of the livelihoods strategies, socio- economic situation, power dynamics and local governance in the target communities is critical to ensuring that facilitators are effective during the field work, and to identifying focus groups within the community. Secondary sources for community-level information would include: • Assessment reports from NGOs or UN organizations • Evaluations of past disaster response operations Vulnerability monitoring programs (e.g. Famine Early Warning System (FEWS-Net) Environmental screening reports for the target area • Government documents including poverty reduction strategies, development plans, official statistics, etc. Consultation with agencies (governmental and non-governmental) working in the target area Seasonal forecasts [] Policy Analysis Depending on the degree of decentralization of decision-making in a particular country, local-level plans or policies may be important in shaping adaptive capacity of vulnerable households and individuals. Regional or district plans and/or sector	

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	strategies can give helpful information on priorities of local governments. Further,
	the process for developing these policies and strategies can provide insights into
	the level of participation of vulnerable people in establishing these priorities. The
	status of implementation can yield useful information on resource and capacity
	constraints faced by local actors.
	[]
	Institutional Mapping
	Institutions play a critical role in supporting or constraining people's capacity to
	adapt to climate change. In order to better understand which institutions are most
	important to people in the target communities, an institutional mapping exercise is
	useful. Institutional mapping involves examination of the following questions:
	Which organizations (governmental, non-governmental and
	community-based) are involved in addressing key issues and problems related to
	climate change? What do they do?
	• Where do they work?
	• How do they interact with the target population? • Where are the overlaps with
	other organizations? • Where are the gaps in capacity?
	• How might some organizations impede the work of others? • What are their
	longer term plans for working in the area? • What are the strengths and
	weaknesses of the institutions?13
	• What is the institution's level of influence over planning and implementation of
	adaptation?
	The mapping exercise assists in identifying the institutions that should be engaged
	in the CVCA process, as well as potential allies and opponents in addressing
	vulnerability at the community level.
	Key Informant Interviews
	Key informants can provide useful insights into local governance structures and
	status of implementation of local policies and programs. Power issues within and
	between communities and other stakeholders can also be surfaced through
	interviews with key actors. Again preserving their anonymity may allow them to
	speak more freely.
	Key informants at the local government/community level would include: Local
	leaders (chiefs, mayors, elected representatives, etc.)
	••
	Representatives of community-based organizations (CBOs) such as farmer's
	groups, water and sanitation committees, savings and credit groups, etc.
	Representatives of women's groups or other rights-based groups
	Representatives of NGOs working on programs or advocacy in the target area •
	Academic/research institutions engaged in the target area
	[]
	Secondary Research In order to effectively plan the field work and to ensure that
	communities are not over-burdened with research and assessment teams, it is
	important to review existing information.
	Sources of information on livelihoods would include: Assessment reports from
	NGOs or UN organizations Project/program baseline studies and/or evaluation
	reports
	Vulnerability monitoring programs (e.g. Famine Early Warning System (FEWS-Net))
	Post-disaster assessments
	Consultation with agoncies (governmental and nen governmental) working in
	Consultation with agencies (governmental and non-governmental) working in
	the target area • Maps showing topography, agro-ecological regions,

		secondary sources, however this information must be verified by local stakeholders. Having more background information can allow the field work to focus specifically on climate change issues. In many cases, very little information may exist at the household/individual level, and so a deeper participatory analysis will be required to understand the dynamics of vulnerability. Participatory Tools Secondary research is complemented by collaborative learning employing typical participatory tools and discussions in focus groups (FGs). FGs usually involve 5 – 12 people selected to be representative of different livelihood systems and/or vulnerable groups in the community. A single FG can include people selected by age and gender (e.g. teenage girls, or elderly women, or young married men), or by some other common characteristic (e.g. people with chronic illnesses, or members of farmer associations). At a minimum, it is suggested to conduct discussions with groups of men and women separately so that participatory tools are designed to draw out issues which can then be examined further through semi-structured discussion. This is meant only as a guide; the field work must be tailored to the particular context and the objectives of the analysis. As well, the range of tools used will depend on the time and resources available for the field work. Fostering participatory processes, and balancing learning with information-gathering, relies on strong, thoughtful facilitation. The Field Guides at the end of this Handbook provide facilitation tips as well as detailed guidance on
		using participatory tools and facilitating discussions with focus groups.
Reporting of indicators/question s used to operationalise construct?	Yes	Guiding Questions Local Government/Community Level Disaster Risk Reduction - What are the most important climate-related hazards the region and/or ecological zone faces? Non-climate related? How are hazards likely to change over time as a result of climate change? - What groups within the community are most vulnerable to disasters? - Do local institutions have access to disaster risk information? - Are local disaster risk management plans being implemented? - Are functional early warning systems in place at the local level? - Does the local government have the capacity to respond to disasters? - Which other institutions are engaged disaster risk management at local level? Guiding Questions Household/Individual Level Disaster Risk Reduction - What are the biggest climate-related hazards faced? Non-climate related hazards? - How are hazards likely to change over time as a result of climate change? - Do households have protected reserves of food and agricultural inputs? - Do households have secure shelter? - Are key assets protected from hazards? - Do people have access to early warnings for climate hazards? Do people have mobility to escape danger in the event of climate hazards?
Sampling strategies reported?	(propos ed	
	metho dology)	
Sampling sizes	(propos	
reported?	ed	
	metho	
Data analysis	dology)	Compiling and Analyzing the Data
Data analysis	Yes	Compiling and Analyzing the Data
methods reported?		After completing the field work, the teams should review the information gathered

	to identify any gaps in the information collected. Follow-up interviews or further
	research may be required to fill gaps.
	Field teams from the same community should then sit together to analyze the
	information gained. Comparing the results for different groups within the
	community is an important part of the process, as this yields insights on
	differential vulnerability. The analysis may expose inequalities within the
	community which may not have been previously recognized. Follow-up discussions
	or interviews with particularly vulnerable groups may be needed to fully
	understand community or household dynamics.
	Once information for specific communities has been analyzed, it can be helpful for
	teams who worked in different communities to come together to identify trends,
	common issues, differences, and to evaluate the process.
	The community information should then be combined with the information gained
	using other tools in order to answer the guiding questions.
	Validating the Analysis
	After preliminary analysis of the data has been completed, a presentation of the
	findings should be made to community representatives to confirm the validity of
	the conclusions. A two-step approach is suggested for the validation process. The
	first step would be to present the analysis to the community focus groups
	themselves to ensure that the conclusions drawn are correct. Next, it is
	recommended that the results are presented to a wider community group and
	local organizations to facilitate dialogue on issues that have been raised by
	particular groups which may have implications for other groups. In particular, this
	provides an opportunity to make other groups in the community aware of the
	views of particularly vulnerable groups. Note that there may be sensitivities
	around some of the issues raised by different groups, and facilitators must be
	prepared to resolve conflicts that may arise. It must also be ensured that the
	sharing of views does not yield negative consequences for any members of the
	community. Local actions can provide guidance on this.
	Feedback from stakeholders should be incorporated into the final analysis.
Conclusion	
Transparency Conclusion:	Partial

Structured summary	of operat	ionalization – transparency assessment
Construct: Resilience	j	
Article: CARE (2009)		
<u>Criterion</u>	<u>Assess</u> <u>ment</u>	Quoted text or Rationale for negative assessment
Construct defined?	Yes	The ability of a community to resist, absorb, and recover from the effects of hazards in a timely and efficient manner, preserving or restoring its essential basic structures, functions and identity.8
Data collection methods reported?	Yes	Secondary Research An understanding of the livelihoods strategies, socio- economic situation, power dynamics and local governance in the target communities is critical to ensuring that facilitators are effective during the field work, and to identifying focus groups within the community. Secondary sources for community-level information would include: • Assessment reports from NGOs or UN organizations • Evaluations of past disaster response operations Vulnerability monitoring programs (e.g. Famine Early Warning System (FEWS-Net) Environmental screening reports for the target area

• Covernment desuments including requests and untiplications
Government documents including poverty reduction strategies,
development plans, official statistics, etc. Consultation with agencies (governmental and non-governmental)
working in the target area
Seasonal forecasts
Policy Analysis
Depending on the degree of decentralization of decision-making in a particular
country, local-level plans or policies may be important in shaping adaptive capacity
of vulnerable households and individuals. Regional or district plans and/or sector
strategies can give helpful information on priorities of local governments. Further,
the process for developing these policies and strategies can provide insights into
the level of participation of vulnerable people in establishing these priorities. The
status of implementation can yield useful information on resource and capacity
constraints faced by local actors.
[]
Institutional Mapping
Institutions play a critical role in supporting or constraining people's capacity to
adapt to climate change. In order to better understand which institutions are most
important to people in the target communities, an institutional mapping exercise is
useful. Institutional mapping involves examination of the following questions:
Which organizations (governmental, non-governmental and
community-based) are involved in addressing key issues and problems related to
climate change? What do they do?
• Where do they work?
• How do they interact with the target population? • Where are the overlaps with
other organizations? • Where are the gaps in capacity?
• How might some organizations impede the work of others? • What are their
longer term plans for working in the area? • What are the strengths and
weaknesses of the institutions?13
• What is the institution's level of influence over planning and implementation of adaptation?
The mapping exercise assists in identifying the institutions that should be engaged
in the CVCA process, as well as potential allies and opponents in addressing
vulnerability at the community level.
Key Informant Interviews
Key informants can provide useful insights into local governance structures and
status of implementation of local policies and programs. Power issues within and
between communities and other stakeholders can also be surfaced through
interviews with key actors. Again preserving their anonymity may allow them to
speak more freely.
Key informants at the local government/community level would include: Local
leaders (chiefs, mayors, elected representatives, etc.)
••
Representatives of community-based organizations (CBOs) such as farmer's
groups, water and sanitation committees, savings and credit groups, etc.
Representatives of women's groups or other rights-based groups
Representatives of NGOs working on programs or advocacy in the target area •
Academic/research institutions engaged in the target area
Secondary Research In order to effectively plan the field work and to ensure that
communities are not over-burdened with research and assessment teams, it is
important to review existing information.

		Sources of information on livelihoods would include: Assessment reports from
		NGOs or UN organizations Project/program baseline studies and/or evaluation
		reports
		•••
		Vulnerability monitoring programs (e.g. Famine Early Warning System (FEWS-Net))
		Post-disaster assessments Consultation with agoncies (governmental and non-governmental) working in
		 Consultation with agencies (governmental and non-governmental) working in the target area Maps showing topography, agro-ecological regions,
		infrastructure, etc.
		In some cases, it will be possible to answer many guiding questions using
		secondary sources, however this information must be verified by local
		stakeholders. Having more background information can allow the field work to
		focus specifically on climate change issues. In many cases, very little information
		may exist at the household/individual level, and so a deeper participatory analysis
		will be required to understand the dynamics of vulnerability.
		Participatory Tools
		Secondary research is complemented by collaborative learning employing typical participatory tools and discussions in focus groups (FGs).
		FGs usually involve 5 – 12 people selected to be representative of different
		livelihood systems and/or vulnerable groups in the community. A single FG can
		include people selected by age and gender (e.g. teenage girls, or elderly women, or
		young married men), or by some other common characteristic (e.g. people with chronic illnesses, or members of farmer associations). At a minimum, it is
		suggested to conduct discussions with groups of men and women separately so
		that participants feel free to talk openly.
		Participatory tools are designed to draw out issues which can then be examined
		further through semi-structured discussion. This is meant only as a guide; the field
		work must be tailored to the particular context and the objectives of the analysis.
		As well, the range of tools used will depend on the time and resources available for
		the field work. Fostering participatory processes, and balancing learning with
		information-gathering, relies on strong, thoughtful facilitation. The Field Guides at
		the end of this Handbook provide facilitation tips as well as detailed guidance on
Reporting of	Yes/no	using participatory tools and facilitating discussions with focus groups.
indicators/question	163/110	
s used to		
operationalise		
construct?		
Sampling strategies	(propos	
reported?	ed	
	metho dology)	
Sampling sizes	(propos	
reported?	ed	
	metho	
	dology)	
Data analysis	Yes	Compiling and Analyzing the Data
methods reported?		After completing the field work, the teams should review the information gathered
		to identify any gaps in the information collected. Follow-up interviews or further
		research may be required to fill gaps. Field teams from the same community should then sit together to analyze the
		information gained. Comparing the results for different groups within the
		community is an important part of the process, as this yields insights on
l		

com or ir und Onc tear com The usin Vali Afte find the first ther recc loca part prov view	erential vulnerability. The analysis may expose inequalities within the munity which may not have been previously recognized. Follow-up discussions interviews with particularly vulnerable groups may be needed to fully erstand community or household dynamics. e information for specific communities has been analyzed, it can be helpful for ins who worked in different communities to come together to identify trends, imon issues, differences, and to evaluate the process. community information should then be combined with the information gained g other tools in order to answer the guiding questions. dating the Analysis er preliminary analysis of the data has been completed, a presentation of the ings should be made to community representatives to confirm the validity of conclusions. A two-step approach is suggested for the validation process. The step would be to present the analysis to the community focus groups mselves to ensure that the conclusions drawn are correct. Next, it is ommended that the results are presented to a wider community group and l organizations to facilitate dialogue on issues that have been raised by iccular groups which may have implications for other groups. In particular, this vides an opportunity to make other groups in the community aware of the vs of particularly vulnerable groups. Note that there may be sensitivities and some of the issues raised by different groups, and facilitators must be
first ther recc loca part prov view	step would be to present the analysis to the community focus groups mselves to ensure that the conclusions drawn are correct. Next, it is mmended that the results are presented to a wider community group and I organizations to facilitate dialogue on issues that have been raised by iccular groups which may have implications for other groups. In particular, this vides an opportunity to make other groups in the community aware of the
preg shar com	bared to resolve conflicts that may arise. It must also be ensured that the ring of views does not yield negative consequences for any members of the imunity. Local actions can provide guidance on this. dback from stakeholders should be incorporated into the final analysis.
Conclusion	
Transparency Conclusion:	Partial

Structured summary	of operat	ionalization – transparency assessment	
Construct: current vu	Construct: current vulnerability		
Article: Ford & Smit (2004)		
<u>Criterion</u>	<u>Assess</u> <u>ment</u>	Quoted text or Rationale for negative assessment	
Construct defined?	Yes	The assessment of current vulnerability requires analyzing and documenting communities' experiences with climatic risks (current exposure) and the adaptive options and resource management strategies employed to address these risks (current adaptive capacity).	
Data collection methods reported?	Yes	Such knowledge can be gained through several estab- lished ethnographic techniques, including focus groups, interviews, and participant observation [] Information on risks and adaptation strategies can also be derived from content analysis of government reports, newspaper articles, Hudson Bay Company postal records, Distant Early Warning Site reports, and the insights of experienced land and resource use managers (Duerden, 2001). Solomon and Hart (1999) used Hudson Bay Com- pany postal records and ships' logbooks to examine storm frequency and severity in the Beaufort Sea. Fienup-Riordan (1999) used Catholic mission records and letters between government officials to assess the nature and impacts of a storm surge in 1931 in southwestern Alaska.	
Reporting of	Yes/no	Indigenous populations possess detailed knowledge of their environ- ment built up	

in diant and (numerican		there are no second above the second concertained and for the the second concertained as
indicators/question s used to		through personal observation and experience and from shared experience of
		members of the community (Duerden and Kuhn, 1998; Huntington, 1998; Usher,
operationalise		2000). Knowledge about the environment and its use can be employed to identify
construct?		and reconstruct events and condi- tions that represent climatic risks to the
		community and to provide insights into the resource-use options and risk-
		management strategies employed to prepare for, avoid or moderate, and recover
		from the effects of exposure
Sampling strategies	No	
reported?		
Sampling sizes	No	
reported?		
Data analysis	Yes	The analysis of current vulnerability requires a timeframe to establish how far back
methods reported?		in time the study should go when analyzing risks and community response. The
		timeframe depends in part on the extent to which past conditions that determined
		adaptability are relevant today, as well as on the availability of information. In
		setting the timeline, one must weigh the value of analyzing how previous genera-
		tions coped with hazards against the recent social, eco- nomic, political, and
		technological changes, which also determine adaptive capacity. Lim et al. (in press)
		suggest limiting historical analysis to one or two decades, although many of the
		traditional coping mechanisms, such as flex- ibility, detailed local knowledge, social
		networks, and intercommunity trade, have a much longer history and remain
		strong among Arctic communities (Berkes and Jolly, 2001).
Conclusion	1	
Transparency Conclu	sion.	Partial
	0.0111	

Structured summary	of operat	ionalization – transparency assessment	
Construct: future ad	Construct: future adaptive capcity		
Article: Ford & Smit	2004)		
<u>Criterion</u>	<u>Assess</u>	Quoted text or Rationale for negative assessment	
	<u>ment</u>		
Construct defined?	Yes	Future adaptive capacity concerns the degree to which the community can deal with the estimated future exposures	
Data collection	Yes	Such knowledge can be gained through several estab- lished ethnographic	
methods reported?		techniques, including focus groups, interviews, and participant observation []	
		Information on risks and adaptation strategies can also be derived from content analysis of government reports, newspaper articles, Hudson Bay Company postal records, Distant Early Warning Site reports, and the insights of experienced land and resource use managers (Duerden, 2001). Solomon and Hart (1999) used Hudson Bay Com- pany postal records and ships' logbooks to examine storm frequency and severity in the Beaufort Sea. Fienup-Riordan (1999) used Catholic	
		mission records and letters between government officials to assess the nature and impacts of a storm surge in 1931 in southwestern Alaska.	
Reporting of indicators/question s used to operationalise construct?	Yes	Indigenous populations possess detailed knowledge of their environ- ment built up through personal observation and experience and from shared experience of members of the community (Duerden and Kuhn, 1998; Huntington, 1998; Usher, 2000). Knowledge about the environment and its use can be employed to identify and reconstruct events and condi- tions that represent climatic risks to the community and to provide insights into the resource-use options and risk- management strategies employed to prepare for, avoid or moderate, and recover from the effects of exposure	

		[] By examining past responses to climate variability and extremes and having the commu- nity identify its future adaptation options and constraints,
Sampling strategies reported?	No	
Sampling sizes reported?	No	
Data analysis methods reported?	Yes	Future adaptive capacity concerns the degree to which the community can deal with the estimated future exposures. By examining past responses to climate variability and extremes and having the commu- nity identify its future adaptation options and constraints, researchers can characterize a community's ability to cope with future changes and collaborate to identify adaptive strategies that will reduce risk.
Conclusion		
Transparency Conclu	sion:	Partial

Structured summary	of operat	ionalization – transparency assessment	
Construct: Livelihood	strategies	5	
Article: Notenbaert e	Article: Notenbaert et al (2013)		
<u>Criterion</u>	<u>Assess</u>	Quoted text or Rationale for negative assessment	
	<u>ment</u>		
Construct defined?	Yes	(Turner et al. 2003).	
Data collection methods reported?	Yes	A detailed household survey was used to elicit household responses (n = 184) about their available resources, live- lihood sources and coping strategies to climate variability.	
Reporting of indicators/questions used to operationalise construct?	Yes	The questionnaire was divided into the following five sections: (1) household composition, livelihood strategies and livestock assets; (2) household livestock ownership, herd dynamics and species; (3) livestock feeding tech- niques, management, products and markets, (4) welfare outcomes (income, food consumption and health) and (5) focused on the main concerns/challenges facing households and their coping strategies. In this last section, households were asked to list and rank their concerns and describe the coping strategies employed to counter these concerns. Furthermore, the households were asked to compare with other households (in the same village) the extent to which they have been coping. For each of the concerns they were facing, they were asked whether they had been coping either better than, worse than or similar to other households in their village.	
Sampling strategies reported?	No	<u> </u>	
Sampling sizes reported?	Yes	household survey was used to elicit household responses (n = 184)	
Data analysis methods reported?	Yes/n o	These pieces of information taken all together, allowed us to come up with a household-level vulnerability index, assessing the degree of a household's vulnerability to climate change and variability in relation to other households in the same village. The index is not based on thresholds nor does it represent an absolute value. It is a relative measure, representing the households' own perception of how they have been coping in the past as compared to other households. For each of the concerns a household listed, an impact factor (li) was established. This impact factor takes the value of ?1 if the household considered itself coping less well than the other households, -1 if it was doing better and 0 if they assessed themselves similar to the other households in the	

village. The rationale being that house- holds that are coping less than others, are more vulnerable, while the ones that are doing better than other households have a lower vulnerability. The concerns listed are not all of equal importance. To correct for this, we established a weight for each of the concerns based on the rank they were assigned across all the sampled households. If a household reported n concerns, the vulnerability of a household was then calculated following formula below. Formula 1: v ¼X n i¼1 n = number of concerns, wi = weight of concerns, li = impact (?1: worse than/0: same/- 1:better). [] Analyzing determinants of coping strategies In an attempt to understand the underlying mechanisms and processes through which these factors influence households' coping capacity, we also analyzed how they influence the choice of coping strategies. To this end, we applied a binary logit regression between the same geographic, demographic and household characteristics and each of the coping strategies. To assess the factors influencing a specific coping strategy, the respondents that utilized this coping strategy were given the value of 1 and 0 otherwise. As such we created dependent vari- ables for each of the coping strategies which were then each regressed against the independent variables from Table 1.ConclusionPartial	· · · · · ·	
Conclusion		more vulnerable, while the ones that are doing better than other households have a lower vulnerability. The concerns listed are not all of equal importance. To correct for this, we established a weight for each of the concerns based on the rank they were assigned across all the sampled households. If a household reported n concerns, the vulnerability of a household was then calculated following formula below. Formula 1: v ¼X n i¼1 n = number of concerns, wi = weight of concerns, li = impact (?1: worse than/0: same/- 1:better). [] Analyzing determinants of coping strategies In an attempt to understand the underlying mechanisms and processes through which these factors influence households' coping capacity, we also analyzed how they influence the choice of coping strategies. To this end, we applied a binary logit regression between the same geographic, demographic and household characteristics and each of the coping strategies. To assess the factors influencing a specific coping strategy, the respondents that utilized this coping strategy were given the value of 1 and 0 otherwise. As such we created dependent vari- ables for each of the coping strategies which were then each regressed against the
Transparency Conclusion: Partial	Conclusion	·
	Transparency Conclusion:	Partial

Appendix M: Validity Assessments

Research Questions

- 1. Is this operationalization valid?
- 2. Is this operationalization feasible?
- 3. (Which operationalizations are most useful?)

To operationalise the first question, we use two sub-questions:

- 1.1 Are the data collection methods used able to generate the **kind** of data required by the construct? Where 'kind' refers, non-exhaustively, to natural, social, critical realist, or interpretivist data etc.
- 1.2 If you put the data gathered through the operational questions all together, do you get a complete and valid understanding of the phenomena that is conceptually defined?

Answer question 1.1 on the basis of the construct definition and the data collection methods cells.

Answer 1.2 on the basis of the construct definition and the 'indicators/questions used to operationalise' cells (and if it is helpful, data analysis methods).

For a given operationalization, if the answer to 1.1 or 1.2 is no, then the answer for Question 1 is also 'no'

The second question is operationalized as follows:

2.1 Is this procedure feasible within CCAFS programs?

Question 2 is to be answered on the basis of all available information.

The questions are to be answered based on the information provided in the structured summaries below. If information in the relevant cells is understandable but not sufficient to answer the questions, answer 'can't tell'. In some cases, construct definitions contain references to previous work. If this work is familiar to you, that is, if you know how a construct is defined in the cited work, then use this knowledge; if the work is not familiar then the appropriate answer is 'can't tell'.

Equally, where a description is not understood, due for example to unclear writing, or to the use of dense terminology from an unfamiliar field, then a reliable answer cannot be given so please fill in 'unclear'.

Question 3 will get dealt with later. Once we have the low-level constructs that work identified, we will put them together. Question 3 will be used on those higher-order operationalizations. Question 3 will ask you, after validity and feasibility assessments have been made, to select preferred candidates.

Transparency Assessment Article summary		
Article	Antwi-Agyei et al (2013)	
Transparent operationalizations	Community; diversified livelihood activities; exposure; financial capital; human capital; natural capital; physical capital; resilience and vulnerable communities; social captial	
Partially transparent		
Not transparent		

Structured summary of operationalization – validity assessment			1.1 DCM Appropriate	1.2 valid empirical rep?	1. conclusion - Valid?	2. Feasible?
Construct: Community Article: Antwi-Agyei et al (2013)						
Construct defined?	Yes	Nevertheless, households are connected to the wider community, which can greatly influence the decision- making process in relation to the use of pro- ductive resources of a particular household; hence, the need to explore vulnerability and adaptation strategies at the household level in relation to the wider socioeconomic and cultural processes occurring at the community level (Thomas et al. 2007).	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell YES	Yes/ no/ can't tell YES
Data collection methods reported?	Yes	Within one resilient and one vulnerable district, 6 specific resilient and vulnerable farming communities (3 in each case) were selected for further research, based on infor- mation gained through interviews with experts and stakeholders (Antwi-Agyei et al. 2012). Three communities were selected from each district to allow comparisons to be made among communities within the same district without sacrificing	Yes			

	1		
		the opportunity for in- depth qualitative analysis; hence,	
		three were deemed a suitable sample size. The resilient	
		communities were Aframso, Babaso and Nyamebekyere	
		located in the Ejura Sekyere- dumasi district of Ashanti	
		region, while vulnerable communities were Adaboya,	
		Ayelbia and Vea located in the Bongo district in the	
		Upper East region (Fig. 1; Antwi-Agyei et al. 2012).	
Reporting of	Yes	communities were Aframso, Babaso and Nyamebekyere	
indicators/questions		located in the Ejura Sekyere- dumasi district of Ashanti	YES
used to		region, while vulnerable communities were Adaboya,	
operationalise		Ayelbia and Vea located in the Bongo district in the	
construct?		Upper East region (Fig. 1; Antwi-Agyei et al. 2012).	
Sampling strategies	Yes	Within one resilient and one vulnerable district, 6 specific	
reported?		resilient and vulnerable	
		farming communities (3 in each case) were selected for	
		further research, based on infor- mation gained through	
		interviews with experts and stakeholders (Antwi-Agyei et	
		al. 2012). Three communities were selected from each	
		district to allow comparisons to be made among	
		communities within the same district without sacrificing	
		the opportunity for in- depth qualitative analysis; hence,	
		three were deemed a suitable sample size.	
Sampling sizes	Yes	6 specific resilient and vulnerable	
reported?		farming communities (3 in each case) were selected	
Data analysis	Yes	Using Minitab, a one-way ANOVA was computed to	
methods reported?		compare the relative vulnerability among the various	
		households and communities, and all differences	
		resulting in p\0.05 were considered statistically	
		significant. K-means cluster analysis using STATISTICA	
		software was undertaken to group the households	
		according to their vulnerability.	

Structured summary of operationalization – validity assessment	1.1 DCM	1.2 valid	1.	2.	
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Construct: Exposure		Appropriate	empirical rep?	conclusion - Valid?	Feasible?	
Article: Antwi-Agyei et al (2013)						
<u>Criterion</u>	<u>Assessment</u>	Quoted text or Rationale for negative assessment				
Construct defined?	Yes	Exposure relates to the extent to which a particular system may be exposed to climatic stresses or variations (IPCC 2007).	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell
Data collection methods reported?	Yes (2ndary data)	These two districts (and 6 communities) represent a range of different agroeco- logical and socioeconomic characteristics in Ghana. The Ejura Sekyeredumasi district (the resilient district) lies within the transitional agroecological zone and experiences bi-modal rainfall patterns with the major rainfall season from April to July and the minor rainfall season from September to October (EPA 2003). Average annual rainfall ranges from 1,200 to 1,500 mm with minimum and maximum temperatures of 20 and 32 ¹² C respectively (EPA 2003). Bongo district (the vulnerable district) lies within the Sudan savannah ag- roecological zone. The Bongo district experiences uni-modal rainfall from May/June - September/October, which constitutes the main farming season (EPA 2003). Average annual rainfall ranges from 800 to 1,000 mm with maximum temperatures of 35 ¹² C (EPA 2003).	NO			
Reporting of indicators/questions used to operationalise construct?	Yes (2ndary data)	These two districts (and 6 communities) represent a range of different agroeco- logical and socioeconomic characteristics in Ghana. The Ejura Sekyeredumasi district (the resilient district) lies within the transitional agroecological zone and experiences bi-modal rainfall patterns with the major rainfall season from April to July and the minor rainfall season from September to October (EPA 2003). Average annual rainfall ranges from 1,200 to 1,500 mm with minimum and maximum temperatures of 20 and 32 IC respectively (EPA 2003). Bongo district (the vulnerable district) lies within the Sudan savannah ag- roecological zone. The Bongo district experiences uni-modal rainfall from May/June - September/October, which constitutes the main farming season (EPA 2003). Average annual rainfall ranges from 800 to 1,000 mm with maximum temperatures of 35 IC (EPA 2003).		NO		

Sampling strategies	Yes (2ndary	These two districts (and 6 communities) represent a range of		
reported?	data)	different agroeco- logical and socioeconomic characteristics		
reporteu:	uataj	in Ghana. The Ejura Sekyeredumasi district (the resilient		
		district) lies within the transitional agroecological zone and		
		experiences bi-modal rainfall patterns with the major rainfall		
		season from April to July and the minor rainfall season from		
		September to October (EPA 2003). Average annual rainfall		
		ranges from 1,200 to 1,500 mm with minimum and		
		maximum temperatures of 20 and 32 ^[2] C respectively (EPA		
		2003). Bongo district (the vulnerable district) lies within the		
		Sudan savannah ag- roecological zone. The Bongo district		
		experiences uni-modal rainfall from May/June -		
		September/October, which constitutes the main farming		
		season (EPA 2003). Average annual rainfall ranges from 800		
		to 1,000 mm with maximum temperatures of 35 IIC (EPA		
		2003).		
Sampling sizes	Yes (2ndary	These two districts (and 6 communities) represent a range of		
reported?	data)	different agroeco- logical and socioeconomic characteristics		
		in Ghana. The Ejura Sekyeredumasi district (the resilient		
		district) lies within the transitional agroecological zone and		
		experiences bi-modal rainfall patterns with the major rainfall		
		season from April to July and the minor rainfall season from		
		September to October (EPA 2003). Average annual rainfall		
		ranges from 1,200 to 1,500 mm with minimum and		
		maximum temperatures of 20 and 32 IIC respectively (EPA		
		2003). Bongo district (the vulnerable district) lies within the		
		Sudan savannah ag- roecological zone. The Bongo district		
		experiences uni-modal rainfall from May/June -		
		September/October, which constitutes the main farming		
		season (EPA 2003). Average annual rainfall ranges from 800		
		to 1,000 mm with maximum temperatures of 35 IPC (EPA		
		2003).		
Data analysis	Yes	In this regard, it is assumed that households within the same		
methods reported?		agroecological zone may be exposed to the same level of		
		climate anomaly (drought in this case) (Eakin and Bojorquez-		
		Tapia 2008). This paper focuses on drought because it is the		
		major threat to African farming systems (UNDP 2007), with		
		some studies predicting increased incidences of drought in		

the future across sub-Saharan Africa (Boko et al. 2007).				
--	--	--	--	--

Structured summary	of operationaliz	ation – validity assessment	1.1 DCM	1.2 valid	1.	2.
Construct: Financial ca	apital		Appropriate	empirical	conclusion -	Feasible?
Article: Antwi-Agyei e	t al (2013)			rep?	Valid?	
Criterion	Assessment	Quoted text or Rationale for negative assessment				
Construct defined?	Yes	Financial capital assets such as savings and remittances play a crucial role in cushioning households against drought-related food shortages. Eliciting information on financial assets was very problematic because of a lack of records on sales and memory lapses. Livestock were considered to offer readily available cash in times of crop failure due to erratic rainfall patterns in the study communities.	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell YES	Yes/ no/ can't tell YES
Data collection methods reported?	Yes	Data presented in this paper were collected using a mixture of participatory methods such as focus group discussions, household questionnaire surveys and key informant interviews. Data collection started with a rapid rural appraisal (Chambers 1994) during which com- munity gatherings and transect walks were conducted with community members including opinion leaders at each of the 6 villages. This provided an overview of the significant social and physical features of the selected communities that influenced their livelihood activities (Sallu et al. 2009). A household questionnaire survey was used to collect both qualitative and quantitative data. The questionnaire survey assessed households' capital assets (financial, human, natural, physical, and social). This information was used to develop a household livelihood vulnerability index (see Sect. 2.3). A total of 270 household ques- tionnaire surveys were conducted in the 6 farming communities (45 Questionnaires in each).	YES			
Reporting of indicators/questions used to	Yes	Eliciting information on financial assets was very problematic because of a lack of records on sales and memory lapses. Livestock were considered to offer readily available cash in		yes	1	

					I
operationalise		times of crop failure due to erratic rainfall patterns in the			
construct?		study communities.			
		[]			
		Households without poultry or livestock scored 1 whilst			
		those with livestock scored 2. In addition, financial assets			
		were assessed by examining the remittances received by the			
		household from family members or friends over the past 12			
		months.			
		[]			
		Households that received remittances in the last 12 months			
		scored 2 and those that did not receive any remittances			
		scored 1. Access to credit may also influence adaptation to			
		climate change including access to inputs such as improved			
		cultivars of crops (e.g. Butt et al. 2006; Fosu-Mensah et al.			
		2012). Hence, it is assumed that households that have no			
		access to credit will be more vulnerable and scored 1 whilst			
		those with access to credit were given a score of 2.			
		[]			
		Table 1 Indicators of household livelihood vulnerability index			
		collected through a household survey across six communities			
		in Ghana			
		[]			
		Access to credit			
		Do you have access to credit for your agricultural activities?			
		Ownership of livestock			
		Do you have livestock or poultry? List the types and numbers			
		of livestock.			
		Remittances received			
		Have you received remittances from family or friends in the			
		last 12 months?			
Sampling strategies	Yes	A random sampling approach was used for the selection of		1	
reported?	103	communities that partici-			
		pated in the study. Within communities, households were			
		stratified into different wealth groups. A random sample of			
		households was then surveyed. The criterion for wealth			
		ranking was developed based on the perception of wealth			
		and poverty by the communities' opinion leaders and			
L		individual households evaluated at the time of the survey.			

		Where there was an under representation of any wealth group, key informants were used to identify appropriate households to supplement the sample. At least one focus group discussion was conducted at each village with between 5 and 10 farmers of different socio-cultural backgrounds to further explore the main themes that emerged in the questionnaire surveys.	
Sampling sizes reported?	Yes	 A total of 270 household ques- tionnaire surveys were conducted in the 6 farming communities (45 Questionnaires in each). [] At least one focus group discussion was conducted at each village with between 5 and 10 farmers of different socio-cultural backgrounds to further explore the main themes that emerged in the questionnaire surveys. 	
Data analysis methods reported?	Yes	To ensure the comparability of indicators that were used in the construction of the household livelihood vulnerability index, all indicators were standardised following the UNDP (2007) procedure of standardising indicators for life expectancy index (Eq. 1). [] Having standardised the indicators, it was then necessary to elicit appropriate weights to them. An unequal weighting system, based on relative importance attached to each indi- cator by local households, extension officers, key informants and experts was used because it was deemed necessary to include the views of both local households and experts in the assessment. Hence, a five-point Likert scale was used where farmers, extension officers, key informants, and experts were asked to rank the five most important indicators that they considered to influence vulnerability at the household level (Table 2). The number of times a particular indicator was cited was used to generate the weighting system (Table 2). The following weights were assigned: 14 % to social capital, 11 % to human capital, 9 % to natural capital, 27 % to financial capital, 10 % to physical capital and 29 % to livelihood diversification (Table 2). The household livelihood vulnerability index for a household was then calculated using	

the following model (Eq. 2) (Vincent 2004).		
HLVI ¼ Ssvi@Wi		
ðÞþðHsvi@WiiÞþ ðNsvi@WiiiÞþðFsvi@WivÞþðPsvi@WvÞ		
þðLsvi®WviÞ		
[]		
Quanti- tative data were transcribed and analysed using SPSS		
and Minitab (Edition 15). Using Minitab, a one-way ANOVA		
was computed to compare the relative vulnerability among		
the various households and communities, and all differences		
resulting in p\0.05 were considered statistically significant. K-		
means cluster analysis using STATISTICA software was		
undertaken to group the households according to their		
vulnerability. K-means cluster analysis, which seeks to group		
cases into distinct clusters by seeking groups that minimise		
variability within clusters and maximise variability between		
clusters (Levia and Page 2000), has been applied to spatial		
vulnerability assessment in dynamic systems (see Antwi-		
Agyei et al. 2012).		

Structured summary	of operationaliz	ation – validity assessment	1.1 DCM	1.2 valid	1.	2.
Construct: human cap	Construct: human capital		Appropriate	empirical	conclusion -	Feasible?
Article: Antwi-Agyei e	t al (2013)			rep?	Valid?	
<u>Criterion</u>	Assessment	Quoted text or Rationale for negative assessment				
Construct defined?	Yes	Human capital assets were represented by two indicators: the educational level of the head of the household (or the most educated person in the household) and the health status of the household (Table 1).			YES	YES
Data collection methods reported?	Yes	Data presented in this paper were collected using a mixture of participatory methods such as focus group discussions, household questionnaire surveys and key informant interviews. Data collection started with a rapid rural appraisal (Chambers 1994) during which com- munity gatherings and transect walks were conducted with community members including opinion leaders at each of the 6 villages. This provided an overview of the significant social	YES			

		and physical features of the selected communities that influenced their livelihood activities (Sallu et al. 2009). A household questionnaire survey was used to collect both qualitative and quantitative data. The questionnaire survey assessed households' capital assets (financial, human, natural, physical, and social). This information was used to develop a household livelihood vulnerability index (see Sect. 2.3). A total of 270 household ques- tionnaire surveys were		
		conducted in the 6 farming communities (45 Questionnaires		
Reporting of indicators/questions used to operationalise construct?	Yes	 in each). Human capital assets were represented by two indicators: the educational level of the head of the household (or the most educated person in the household) and the health status of the household (Table 1). No formal education was afforded a value of 1; 2 in the case of only primary education; 3 in the case of secondary education; and 4 for households that had tertiary education. [] To assess health status, households were asked about the number of times they have been to the hospital (or hospitalised) within the last 12 months. House- holds with members that had been to the hospital were scored 1 whilst those with members that had not been to hospital as out patients (and those not needing any medical attention) within this period were scored 2. Also, situations where members of a household required hospital treatment but could not arrange transport and other resources needed were taken into consideration when scoring such a household. [] Table 1 Indicators of household livelihood vulnerability index collected through a household survey across six communities in Ghana [] 	YES	
		Could you please state the highest education attained? Health status Have any member of this household been ill in the last 12		

		months?		
Sampling strategies reported?	Yes	months?A random sampling approach was used for the selection of communities that partici- pated in the study. Within communities, households were stratified into different wealth groups. A random sample of 		
Sampling sizes reported?	Yes	A total of 270 household ques- tionnaire surveys were conducted in the 6 farming communities (45 Questionnaires in each). [] At least one focus group discussion was conducted at each village with between 5 and 10 farmers of different socio- cultural backgrounds to further explore the main themes that emerged in the questionnaire surveys.		
Data analysis methods reported?	Yes	To ensure the comparability of indicators that were used in the construction of the household livelihood vulnerability index, all indicators were standardised following the UNDP (2007) procedure of standardising indicators for life expectancy index (Eq. 1).[]Having standardised the indicators, it was then necessary to elicit appropriate weights to them. An unequal weighting system, based on relative importance attached to each indi- cator by local households, extension officers, key informants and experts was used because it was deemed necessary to include the views of both local households and experts in the assessment. Hence, a five-point Likert scale was used where farmers, extension officers, key informants, and experts were		

Structured summary	Structured summary of operationalization – validity assessment		1.1 DCM	1.2 valid	1.	2.
Construct: Natural Capital		Appropriate	empirical	conclusion -	Feasible?	
Article: Antwi-Agyei e	Article: Antwi-Agyei et al (2013)			rep?	Valid?	
<u>Criterion</u>	<u>Assessment</u>	Quoted text or Rationale for negative assessment				
Construct defined?	Yes	Natural capital assets were assessed by two indicators. The			YES-ISH	YES
		first was the size of the farm holding under cultivation				
		scored 3; those cultivating 16-20 acres scored 4, and				

		households cultivating [20 acres scored 5. T			
Data collection	Yes	Data presented in this paper were collected using a mixture	YES		
methods reported?		of participatory methods such as focus group discussions,			
		household questionnaire surveys and key informant			
		interviews. Data collection started with a rapid rural			
		appraisal (Chambers 1994) during which com- munity			
		gatherings and transect walks were conducted with			
		community members including opinion leaders at each of the			
		6 villages. This provided an overview of the significant social			
		and physical features of the selected communities that			
		influenced their livelihood activities (Sallu et al. 2009). A			
		household questionnaire survey was used to collect both			
		qualitative and quantitative data. The questionnaire survey			
		assessed households' capital assets (financial, human,			
		natural, physical, and social). This information was used to			
		develop a household livelihood vulnerability index (see Sect.			
		2.3). A total of 270 household ques- tionnaire surveys were			
		conducted in the 6 farming communities (45 Questionnaires			
		in each).			
Reporting of	Yes	Natural capital assets were assessed by two indicators. The		CAN'T	
indicators/questions		first was the size of the farm holding under cultivation (this		TELL	
used to		was estimated as the average area of cultivated land over the			
operationalise		past 5 years) (Table 1). It is assumed that the larger the farm			
construct?		holding, the greater the opportunity for the household to			
		have more crops and yield, and hence the lower the			
		vulnerability to climate change, though it is noted that labour			
		availability and financial capital both affect the reality of how			
		much land can be cultivated. Households which cultivated			
		less than 5 acres scored 1; those cultivating between 5 and			
		10 acres scored 2; those cultivating between 11 and 15 acres			
		scored 3; those cultivating 16-20 acres scored 4, and			
		households cultivating [20 acres scored 5. The type of land			
		tenure and level of security it provides may have serious			
		implications for the management of agricultural soils and			
		could indirectly affect crop productivity and environmental			
		sustainability, conse- quently influencing household			
		vulnerability (Butt et al. 2006). Three different tenure			
		arrangements were identified in the study communities.			

	1			
		These were "land inherited", "land purchased" and "land		
		rented" by the household. A score of 1 was given to		
		households who rented their farmlands; 2 for households		
		who purchased their farmlands; and 3 for those who		
		inherited their farmlands. Households that inherited their		
		farm lands were given the highest score because it is		
		assumed that they will have the most secure land tenure.		
		[]		
		Table 1 Indicators of household livelihood vulnerability index		
		collected through a household survey across six communities		
		in Ghana		
		[]		
		Farm holding size		
		Could you please state the size of farm holding in acres?		
		Tenure system		
		By what arrangements do you have access to your farm land		
		for farming activities?		
Sampling strategies	Yes	A random sampling approach was used for the selection of		
reported?		communities that partici-		
		pated in the study. Within communities, households were		
		stratified into different wealth groups. A random sample of		
		households was then surveyed. The criterion for wealth		
		ranking was developed based on the perception of wealth		
		and poverty by the communities' opinion leaders and		
		individual households evaluated at the time of the survey.		
		Where there was an under representation of any wealth		
		group, key informants were used to identify appropriate		
		households to supplement the sample. At least one focus		
		group discussion was conducted at each village with between		
		5 and 10 farmers of different socio-cultural backgrounds to		
		further explore the main themes that emerged in the		
		questionnaire surveys.		
Sampling sizes	Yes	A total of 270 household ques- tionnaire surveys were		
reported?		conducted in the 6 farming communities (45 Questionnaires		
		in each).		
		[]		
		At least one focus group discussion was conducted at each		
		village with between 5 and 10 farmers of different socio-		

		cultural backgrounds to further explore the main themes that emerged in the questionnaire surveys.	
Data analysis	Yes	To ensure the comparability of indicators that were used in	
methods reported?		the construction of the household livelihood vulnerability	
		index, all indicators were standardised following the UNDP	
		(2007) procedure of standardising indicators for life	
		expectancy index (Eq. 1).	
		[]	
		Having standardised the indicators, it was then necessary to	
		elicit appropriate weights to them. An unequal weighting	
		system, based on relative importance attached to each indi-	
		cator by local households, extension officers, key informants	
		and experts was used because it was deemed necessary to	
		include the views of both local households and experts in the	
		assessment. Hence, a five-point Likert scale was used where	
		farmers, extension officers, key informants, and experts were	
		asked to rank the five most important indicators that they	
		considered to influence vulnerability at the household level	
		(Table 2). The number of times a particular indicator was	
		cited was used to generate the weighting system (Table 2).	
		The following weights were assigned: 14 % to social capital,	
		11 % to human capital, 9 % to natural capital, 27 % to	
		financial capital, 10 % to physical capital and 29 % to	
		livelihood diversification (Table 2). The household livelihood	
		vulnerability index for a household was then calculated using	
		the following model (Eq. 2) (Vincent 2004).	
		HLVI ¼ Ssvi@Wi	
		ðÞþðHsvi⊠WiiÞþ ðNsvi⊠WiiiÞþðFsvi⊠WivÞþðPsvi⊠WvÞ	
		þðLsvi®WviÞ	
		[]	
		Quanti- tative data were transcribed and analysed using SPSS	
		and Minitab (Edition 15). Using Minitab, a one-way ANOVA	
		was computed to compare the relative vulnerability among	
		the various households and communities, and all differences	
		resulting in p\0.05 were considered statistically significant. K-	
		means cluster analysis using STATISTICA software was	
		undertaken to group the households according to their	
		vulnerability. K-means cluster analysis, which seeks to group	

cases into distinct clusters by seeking groups that minimise variability within clusters and maximise variability between clusters (Levia and Page 2000), has been applied to spatial		
vulnerability assessment in dynamic systems (see Antwi-		
Agyei et al. 2012).		

Structured summary	of operationaliz	ation – validity assessment	1.1 DCM	1.2 valid	1.	2.
Construct: Physical ca	apital		Appropriate	empirical	conclusion -	Feasible?
Article: Antwi-Agyei e	et al (2013)			rep?	Valid?	
<u>Criterion</u>	Assessment	Quoted text or Rationale for negative assessment				
Construct defined?	Yes	Physical assets that were assessed included the presence of			YES	YES
		irrigation facilities and own- ership of radios, television or				
		mobile phones by a household (Table 1).				
Data collection	Yes	Data presented in this paper were collected using a mixture	YES			
methods reported?		of participatory methods such as focus group discussions,				
		household questionnaire surveys and key informant				
		interviews. Data collection started with a rapid rural				
		appraisal (Chambers 1994) during which com- munity				
		gatherings and transect walks were conducted with				
		community members including opinion leaders at each of the				
		6 villages. This provided an overview of the significant social				
		and physical features of the selected communities that				
		influenced their livelihood activities (Sallu et al. 2009). A				
		household questionnaire survey was used to collect both				
		qualitative and quantitative data. The questionnaire survey				
		assessed households' capital assets (financial, human,				
		natural, physical, and social). This information was used to				
		develop a household livelihood vulnerability index (see Sect.				
		2.3). A total of 270 household ques- tionnaire surveys were				
		conducted in the 6 farming communities (45 Questionnaires				
		in each).				
Reporting of	Yes	Physical assets that were assessed included the presence of		YES-ISH		
indicators/questions		irrigation facilities and own- ership of radios, television or				
used to		mobile phones by a household (Table 1). Irrigation facilities				
operationalise		are crucial for rain-fed agriculture-dependent households, as				

construct?		these facilities help farmers to practise dry season farming. It is assumed that households with irrigation facilities will be less vulnerable to changing rainfall patterns. Hence, households without irrigation facilities scored 1, whilst those with these facilities scored 2. The presence of radios, television or mobile phone in a rural household can be an effective tool for communication and accessing information on changing weather patterns (see Naab and Koranteng 2012). Here, households with any of these three assets scored 2, and those without any scored 1. Physical assets such as road networks and the availability of markets and health facilities may enhance the adaptive capacity of a household (see Zhang et al. 2007). These assets were not included in the vulnerability computation because field observations suggested that these physical assets did not significantly differ amongst either the resilient or vul- nerable communities. [] Irrigation facilities Do you have access to irrigation facilities for dry season farming? Ownership of radio, television or mobile phone Could you please list all communication gadgets that you		
Sampling strategies reported?	Yes	have? These include TV, mobile phone or radios etc. A random sampling approach was used for the selection of communities that partici- pated in the study. Within communities, households were stratified into different wealth groups. A random sample of households was then surveyed. The criterion for wealth ranking was developed based on the perception of wealth and poverty by the communities' opinion leaders and individual households evaluated at the time of the survey. Where there was an under representation of any wealth group, key informants were used to identify appropriate households to supplement the sample. At least one focus group discussion was conducted at each village with between 5 and 10 farmers of different socio-cultural backgrounds to		

		further explore the main themes that emerged in the		
		questionnaire surveys.		
Sampling sizes	Yes	A total of 270 household ques- tionnaire surveys were		
reported?		conducted in the 6 farming communities (45 Questionnaires		
		in each).		
		[]		
		At least one focus group discussion was conducted at each		
		village with between 5 and 10 farmers of different socio-		
		cultural backgrounds to further explore the main themes that		
		emerged in the questionnaire surveys.		
Data analysis	Yes	To ensure the comparability of indicators that were used in		
methods reported?		the construction of the household livelihood vulnerability		
		index, all indicators were standardised following the UNDP		
		(2007) procedure of standardising indicators for life		
		expectancy index (Eq. 1).		
		[]		
		Having standardised the indicators, it was then necessary to		
		elicit appropriate weights to them. An unequal weighting		
		system, based on relative importance attached to each indi-		
		cator by local households, extension officers, key informants		
		and experts was used because it was deemed necessary to		
		include the views of both local households and experts in the		
		assessment. Hence, a five-point Likert scale was used where		
		farmers, extension officers, key informants, and experts were		
		asked to rank the five most important indicators that they		
		considered to influence vulnerability at the household level		
		(Table 2). The number of times a particular indicator was		
		cited was used to generate the weighting system (Table 2).		
		The following weights were assigned: 14 % to social capital,		
		11 % to human capital, 9 % to natural capital, 27 % to		
		financial capital, 10 % to physical capital and 29 % to		
		livelihood diversification (Table 2). The household livelihood		
		vulnerability index for a household was then calculated using		
		the following model (Eq. 2) (Vincent 2004).		
		HLVI ¼ Ssvi⊠Wi		
		ðÞþðHsvi@WiiÞþ ðNsvi@WiiiÞþðFsvi@WivÞþðPsvi@WvÞ		
		þðLsvi®WviÞ		
		[]		

Quanti- tative data were transcribed and analysed using SPSS		
and Minitab (Edition 15). Using Minitab, a one-way ANOVA		
was computed to compare the relative vulnerability among		
the various households and communities, and all differences		
resulting in p\0.05 were considered statistically significant. K-		
means cluster analysis using STATISTICA software was		
undertaken to group the households according to their		
vulnerability. K-means cluster analysis, which seeks to group		
cases into distinct clusters by seeking groups that minimise		
variability within clusters and maximise variability between		
clusters (Levia and Page 2000), has been applied to spatial		
vulnerability assessment in dynamic systems (see Antwi-		
Agyei et al. 2012).		

Structured summary	of operationaliz	ation – validity assessment	1.1 DCM	1.2 valid	1.	2.
Construct: Resilient a	nd vulnerable co	ommunities	Appropriate	empirical	conclusion -	Feasible?
Article: Antwi-Agyei e	et al (2013)			rep?	Valid?	
<u>Criterion</u>	<u>Assessment</u>	Quoted text or Rationale for negative assessment				
Construct defined?	Yes	was based on a definition of "vulnerable" regions and districts as those where relatively minor perturbations in rainfall over the past 40 years had significant impacts on crop yields (Antwi-Agyei et al. 2012). Conversely, "resilient" regions and districts were defined as those where even large droughts were observed to have had only minor impacts on crop yields (Simelton e			CAN'T TELL	CAN'T TELL
Data collection methods reported?	Yes (2ndary data)	The Ejura Sekyeredumasi district of Ashanti region and Bongo district of the Upper East region of Ghana were selected for this study having been previously identified as the most resilient and vulnerable regions and districts respectively in Ghana (Antwi-Agyei et al. 2012). This was based on a definition of "vulnerable" regions and districts as those where relatively minor perturbations in rainfall over the past 40 years had significant impacts on crop yields (Antwi-Agyei et al. 2012). Conversely, "resilient" regions and districts were defined as those where even large droughts were observed	CAN'T TELL			

		to have had only minor impacts on crop yields (Simelton et al. 2009).		
Reporting of	Yes (2ndary	The Ejura Sekyeredumasi district of Ashanti region and Bongo	CAN'T	
indicators/questions	data)	district of the Upper East region of Ghana were selected for	TELL	
used to		this study having been previously identified as the most		
operationalise		resilient and vulnerable regions and districts respectively in		
construct?		Ghana (Antwi-Agyei et al. 2012). This was based on a		
		definition of "vulnerable" regions and districts as those		
		where relatively minor perturbations in rainfall over the past		
		40 years had significant impacts on crop yields (Antwi-Agyei		
		et al. 2012). Conversely, "resilient" regions and districts were		
		defined as those where even large droughts were observed		
		to have had only minor impacts on crop yields (Simelton et		
Sampling strategies	Yes	al. 2009). Advancing this work further, an assessment of livelihoods		
reported?	163	offers the opportunity to highlight the various adaptations		
reporteu:		that might be available to determine how rural communities		
		can cope with declining crop yields due to drought, and also		
		how such declining yields can affect livelihoods (see Ziervogel		
		and Calder 2003). Within one resilient and one vulnerable		
		district, 6 specific resilient and vulnerable		
		farming communities (3 in each case) were selected for		
		further research, based on infor- mation gained through		
		interviews with experts and stakeholders (Antwi-Agyei et al.		
		2012). Three communities were selected from each district		
		to allow comparisons to be made among communities within		
		the same district without sacrificing the opportunity for in-		
		depth qualitative analysis; hence, three were deemed a		
		suitable sample size.		
		[]		
		The resilient communities were Aframso, Babaso and		
		Nyamebekyere located in the Ejura Sekyere- dumasi district		
		of Ashanti region, while vulnerable communities were		
		Adaboya, Ayelbia and Vea located in the Bongo district in the		
		Upper East region (Fig. 1; Antwi-Agyei et al. 2012).		
Sampling sizes	Yes	The Ejura Sekyeredumasi district of Ashanti region and Bongo		
reported?		district of the Upper East region of Ghana were selected for		
		this study having been previously identified as the most		

		resilient and vulnerable regions and districts respectively in Ghana [] Within one resilient and one vulnerable district, 6 specific resilient and vulnerable farming communities (3 in each case) were selected for further research,		
Data analysis methods reported?	Yes	Using Minitab, a one-way ANOVA was computed to compare the relative vulnerability among the various households and communities, and all differences resulting in p\0.05 were considered statistically significant. K-means cluster analysis using STATISTICA software was undertaken to group the households according to their vulnerability.		

Structured summary	of operationaliz	ation – validity assessment	1.1 DCM	1.2 valid	1.	2.
Construct: Social Cap	tial		Appropriate	empirical	conclusion -	Feasible?
Article: Antwi-Agyei e	et al (2013)			rep?	Valid?	
<u>Criterion</u>	Assessment	Quoted text or Rationale for negative assessment				
Construct defined?	Yes	Social capital—including connections to technical support and social resources such as networks, associations and affiliations—was assessed by counting the number of associations or groups to which the members of the household belong			NO	YES
Data collection methods reported?	Yes	Data presented in this paper were collected using a mixture of participatory methods such as focus group discussions, household questionnaire surveys and key informant interviews. Data collection started with a rapid rural appraisal (Chambers 1994) during which com- munity gatherings and transect walks were conducted with community members including opinion leaders at each of the 6 villages. This provided an overview of the significant social and physical features of the selected communities that influenced their livelihood activities (Sallu et al. 2009). A household questionnaire survey was used to collect both qualitative and quantitative data. The questionnaire survey	NO			

		Do you belong to any social groups? Could you please list them?	
Sampling strategies reported?	Yes	them? A random sampling approach was used for the selection of communities that partici- pated in the study. Within communities, households were stratified into different wealth groups. A random sample of households was then surveyed. The criterion for wealth ranking was developed based on the perception of wealth and poverty by the communities' opinion leaders and individual households evaluated at the time of the survey. Where there was an under representation of any wealth group, key informants were used to identify appropriate households to supplement the sample. At least one focus	
		group discussion was conducted at each village with between 5 and 10 farmers of different socio-cultural backgrounds to further explore the main themes that emerged in the questionnaire surveys.	
Sampling sizes reported?	Yes	A total of 270 household ques- tionnaire surveys were conducted in the 6 farming communities (45 Questionnaires in each). [] At least one focus group discussion was conducted at each village with between 5 and 10 farmers of different socio- cultural backgrounds to further explore the main themes that emerged in the questionnaire surveys.	
Data analysis methods reported?	Yes	To ensure the comparability of indicators that were used in the construction of the household livelihood vulnerability index, all indicators were standardised following the UNDP (2007) procedure of standardising indicators for life expectancy index (Eq. 1). [] Having standardised the indicators, it was then necessary to elicit appropriate weights to them. An unequal weighting system, based on relative importance attached to each indi- cator by local households, extension officers, key informants and experts was used because it was deemed necessary to include the views of both local households and experts in the assessment. Hence, a five-point Likert scale was used where	

farmers, extension officers, key informants, and experts were		
asked to rank the five most important indicators that they		
considered to influence vulnerability at the household level		
(Table 2). The number of times a particular indicator was		
cited was used to generate the weighting system (Table 2).		
The following weights were assigned: 14 % to social capital,		
11 % to human capital, 9 % to natural capital, 27 % to		
financial capital, 10 % to physical capital and 29 % to		
livelihood diversification (Table 2). The household livelihood		
vulnerability index for a household was then calculated using		
the following model (Eq. 2) (Vincent 2004).		
HLVI ¼ Ssvi🛛 Wi		
ðÞþðHsvi@WiiÞþ ðNsvi@WiiiÞþðFsvi@WivÞþðPsvi@WvÞ		
þðLsvi®WviÞ		
[]		
Quanti- tative data were transcribed and analysed using SPSS		
and Minitab (Edition 15). Using Minitab, a one-way ANOVA		
was computed to compare the relative vulnerability among		
the various households and communities, and all differences		
resulting in p\0.05 were considered statistically significant. K-		
means cluster analysis using STATISTICA software was		
undertaken to group the households according to their		
vulnerability. K-means cluster analysis, which seeks to group		
cases into distinct clusters by seeking groups that minimise		
variability within clusters and maximise variability between		
clusters (Levia and Page 2000), has been applied to spatial		
vulnerability assessment in dynamic systems (see Antwi-		

Transparency Assessment Article summary			
Article	Baca et al (2004)		
Transparent operationalizations	Adaptive capacity; Exposure		
Partially transparent	Inconclusive: Sensitivity		
Not transparent			

Structured summary of operationalization – validity assessment			1.1 DCM	1.2	1.	2.	
Construct: Adap	otive Capaci	ty		Appropr	valid	conclus	Feasib
Article: Baca et	al (2004)			iate	empiri	ion - Valid?	le?
<u>Criterion</u>	Assessm ent	Quoted text or Ration	nale for negative assessment		cal rep?		
Construct defined?	Yes	in order to reduce or depends partly on the benefits and network health and technolog so as to maintain, mi	capacity is defined as a system's ability to adjust to climate change mitigate possible damage [3]. Adaptive capacity is dynamic, and e society productive base, such as: natural and artificial assets, social as, human capital and institutions, governance, national income, yg [2], and how much capability a society has to adapt to the changes nimize loss of, or maximize gain in welfare.	CAN'T		NO	NO
Data collection methods reported?	Yes	farms in each country	The indicators were used to assess the vulnerability of coffee farms in each country. From a population of 7,000 farmer members from 15 organizations across the four countries, 558 farmers were interviewed.				
Reporting of Yes indicators/que stions used to operationalise construct?		shown in Table S1 in or a binary scale of 0 for each indicator we	n constructed to evaluate each indicator as File S1. To quantify the parameters scales from 1 to 5 were applied and 1, depending on the nature of the parameter. The final values re calculated by averaging all the parameters and then transformed ariable scale, with 0 being low and 1 being high sensitivity and		NO		
		Indicator Management of shade trees and reforestation	Parameter Number of trees cut Number of trees planted				
		Pollution	Waste management				

	Release of fermentation residues into water	
	Management of agrochemical containers	
	Coffee waste management	
	Area burning annually	
Viability of r		
harvest infra		
Access to cr		
Access to cr	Interest rate of credit	
	Opportunity of credits	
Income	Number of sources of income	
diversificatio		
Access to sp	beclarty Destined for sale	
markets	Creasial market access	
	Special market access Varieties	
Access to	Varieties	
alternative		
technologie		
	Drip irrigation	
Orregiatio	Water harvesting	
Organizatio		
	Time Benefits	
Knowledge		
policies rela		
the coffee s		
environmen	ital laws	
and other	For the second all large	
	Environmental laws	
	Land polices	
Access to fo		
and informa	al	
education		
	Quality of technical assistance	
	Crops for which receive technical assistance	
	Types of media accessed	
Knowledge		
agro ecolog	ical	
system		

		Coffee intercropping Pests and diseases		
Sampling strategies reported?	Yes	From a population of 7,000 farmer members from 15 organizations across the four countries, 558 farmers were interviewed. The farmers may be considered representative of small-scale organized farmers, but should not be considered representative of the coffee farmers as a whole in each country. The sample size was defined using the formula for finite populations [20] and then individual farmers were selected randomly, stratified according to exposure level and country by 2050 (Table 1).		
Sampling sizes reported?	Yes	From a population of 7,000 farmer members from 15 organizations across the four countries, 558 farmers were interviewed.		
Data analysis methods reported?	Yes	A cluster analysis was carried out for each indicator of sensitivity and adaptive capacity based on the score of each family using the Ward method with Euclidean distance. Then an Analysis of Variance (ANOVA) was applied using the LSD- Fisher test to compare the averages for each indicator by cluster. The indicators in each cluster that obtained significantly different sample averages were classified in three levels on a scale of 0 to 1 (0–0.33=low, 0.34–0.66=medium, 0.67–1=high). Clusters with the greatest number of indicators with high, medium or low averages were classified as having high, medium or low sensitivity and adaptive capacity [21]. Each factor (exposure, sensitivity and adaptive capacity), as previously explained, and was classified into three levels (high, medium, low). To calculate the vulnerability equation we assigned each level a quantitative value: low=1, medium=2, high=3. With three factors and three levels per factor, we obtained 27 possible combinations. After applying the equation we obtained 7 values (–1,0,1,2,3,4,5), which we used to define low (–1,0), medium (1,2,3), and high (4,5) levels of vulnerability (Figure 1). A Principal Components Analysis (PCA) was carried out to identify the indicators that most contribute to the sensitivity or adaptive capacity of families in different municipalities.		

Structured summary of operationalization – validity assessment		
Construct: Exposure		
Article: Baca et al (20	- Valid?	
<u>Criterion</u>		
Construct defined?	CAN'T TELL	
	-	

Data collection	Yes (2ndary	The methodology combined current climate data with future climate	CAN'T TELL		
methods reported?	data)	change predictions. To map current climatic suitability, the historical climate database WorldClim (www.worldclim.org) was used []			
		To predict future climate, the SRES-A2a scenario 19 IPCC			
		Global Circulation Models were used. The Delta method was used to			
		down-scale the climate change data, based on the sum of the			
		anomalies interpolated with the WorldClim monthly high- resolution			
		surfaces [15].			
Reporting of	Yes (2ndary	To map current climatic suitability, the historical climate database		CAN'T	
indicators/questions	data)	WorldClim (www.worldclim.org) was used. The variables included a		TELL	
used to		total of 19 bioclimatic variables derived from monthly precipitation,			
operationalise		monthly median temperature, minimum and maximum temper-			
construct?		ature [15]. Bioclimatic variables represent annual trends, season-			
		ality, and extreme conditions.			
Sampling strategies	Yes (2ndary	The methodology combined current climate data with future climate			
reported?	data)	change predictions. To map current climatic suitability, the historical			
		climate database WorldClim (www.worldclim.org) was used []			
		To predict future climate, the SRES-A2a scenario 19 IPCC			
		Global Circulation Models were used. The Delta method was used to			
		down-scale the climate change data, based on the sum of the			
		anomalies interpolated with the WorldClim monthly high- resolution			
Course line of a second	Vee (2) edemo	surfaces [15].			
Sampling sizes	Yes (2ndary	The methodology combined current climate data with future climate			
reported?	data)	change predictions. To map current climatic suitability, the historical climate database WorldClim (www.worldclim.org) was used			
		To predict future climate, the SRES-A2a scenario 19 IPCC			
		Global Circulation Models were used. The Delta method was used to			
		down-scale the climate change data, based on the sum of the			
		anomalies interpolated with the WorldClim monthly high- resolution			
		surfaces [15].			
Data analysis	Yes	The Maximum entropy (MAXENT) method, a general-purpose			
methods reported?		method for making predictions or inferences based on incomplete			
		information [17], was used to predict the future climatic suitability			
		for coffee. The model requires calibration with climate data for			
		current coffee production areas, which is provided by GPS			

coordinates. The model assumes that a certain future climate at a	
given site is as suitable or unsuitable for the crop as is the same	
climate at another site in the present. This assumption is reasonable	
as long as crop genetics and cropping systems do not significantly	
change. It thus predicts what will happen in terms of relative climatic	
suitability for a crop if these factors do not change and helps identify	
those sites where adaptations in crops and cropping systems are	
necessary in order to avoid the consequences of a predicted decline	
in climatic suitability. This approach has previously been used for	
coffee [6], [18]. Two measures of uncertainty were calculated: (1) the	
agreement	
of calculated models as a percentage of models that predict changes	
in the same direction and (2) the coefficient of variation (CV) among	
models.	
[]	
For exposure, the relative decreases in climatic suitability according	
to the MAXENT model were divided into three classes of suitability	
loss (low, medium, high). For sensitivity and adaptive capacity,	
indicators were identified and quantified through interviews with the	
farming families.	
Each factor (exposure, sensitivity and adaptive capacity), as	
previously explained, and was classified into three levels (high,	
medium, low). To calculate the vulnerability equation we assigned	
each level a quantitative value: low=1, medium=2, high=3. With	
three factors and three levels per factor, we obtained 27 possible	
combinations. After applying the equation we obtained 7 values (–	
1,0,1,2,3,4,5), which we used to define low (–1,0), medium (1,2,3,)	
and high (4,5) levels of vulnerability (Figure 1). A Principal	
Components Analysis (PCA) was carried out to identify the indicators	
that most contribute to the sensitivity or adaptive capacity of	
families in different municipalities.	

Transparency Assessment Article summary			
Article Capaldo et al (2010)			
Transparent operationalizations	Current exposure to risks; current socio-economic status		
Partially transparent			
Not transparent Risk management; risks			

Structured summary	of operationaliz	ration – validity assessment	1.1 DCM	1.2 valid	1.	2.
Construct: Current ex	posure to risk		Appropriate	empirical	conclusion -	Feasible?
Article: Capaldo et al	(2010)			rep?	Valid?	
<u>Criterion</u>	<u>Assessment</u>	Quoted text or Rationale for negative assessment				
Construct defined?	YES	conceptual framework drawn from it by Løvendal and Knowles (2005).			CAN'T TELL	
Data collection methods reported?	2ndary data	We analyze a sample of 1831 rural households from Nicaragua, surveyed in the 2001 Encuesta Nacional de Hogares Sobre Medición de Nivel de Vida, by the Instituto Nacional de Estadísticas y Censos INEC de Nicaragua. Constructed variables used in the analysis were prepared by the Rural Income Generating Activities (RIGA) project team at FAO.	CAN'T TELL			
Reporting of indicators/questions used to operationalise construct?	Yes/no	We use ex-post data on shocks and risk management strategies. These include information on the incidence of a covariate shock (such as drought) and an idiosyncratic shock (illness) [] Table 1: Summary of variables Drought shock Illness shock		YES		
Sampling strategies reported?	2ndary data	We analyze a sample of 1831 rural households from Nicaragua, surveyed in the 2001 Encuesta Nacional de Hogares Sobre Medición de Nivel de Vida, by the Instituto Nacional de Estadísticas y Censos INEC de Nicaragua. Constructed variables used in the analysis were prepared by the Rural Income Generating Activities (RIGA) project team at FAO.				

Sampling sizes reported?	Yes	sample of 1831 rural households		
Data analysis methods reported?	Yes	After accounting for heteroskedasticity through the use of generalized least squares, we estimate vulnerability to food insecurity as the normal probability that the "individual minimum dietary energy requirement under light physical activity" exceeds the expected individual dietary energy consumption (measured in kilocalories). Since the main purpose of this paper is to propose a methodology to analyze and estimate vulnerability, we ignore possible econometric complications that are not directly relevant. However, by all means the results presented here are to be considered preliminary.		

Structured summary	Structured summary of operationalization – validity assessment		1.1 DCM	1.2 valid	1.	2.
Construct: Current so	cio-economic cł	naracteristics	Appropriate	empirical	conclusion -	Feasible?
Article: Capaldo et al	(2010)			rep?	Valid?	
<u>Criterion</u>	Assessment	Quoted text or Rationale for negative assessment				
Construct defined?	YES	conceptual framework drawn from it by Løvendal and Knowles (2005).			CAN'T TELL	
Data collection methods reported?	2ndary data	We analyze a sample of 1831 rural households from Nicaragua, surveyed in the 2001 Encuesta Nacional de Hogares Sobre Medición de Nivel de Vida, by the Instituto Nacional de Estadísticas y Censos INEC de Nicaragua. Constructed variables used in the analysis were prepared by the Rural Income Generating Activities (RIGA) project team at FAO.	CAN'T TELL			
Reporting of indicators/questions used to operationalise construct?	Yes	Information on the structure of a household includes the age of the head of household (which is also a proxy for working experience), gender, marital status, language spoken (as a proxy for households belonging to an indigenous group) and the share of female labor. The latter also approximates labor availability within the household. We observed a relatively high proportion of single- or female-headed households (23% and 18% respectively).		YES		

Household assets are assessed in using education, as well as		
wealth-related variables (number of rooms, cement floor,		
telephone, access to safe water, bikes, radios, TV sets		
owned4), and social capital different		
through participation of members in community		
organizations. Moreover, types of livestock and land assets		
are also taken into account to approximate		
household wealth and potential credit-related constraints.		
We use access to a network for migration as a measure of the		
ability of a household to receive assistance from members		
living outside the location and as a proxy of a diversified		
income portfolio. Distance from a road, school, and health		
facilities, are variables used for measuring a household's		
access to infrastructure.		
[]		
Table 1: Summary of variables		
Kilocalories per capita		
Age of hh head		
Highest education in hh		
Single head		
Female head of hh widow		
Female headed hh		
Hh labor		
Indigenous household		
Hh size		
Rooms		
Cement floor in house		
Telephone in hh		
Hh members participating in comm. org.		
Access to hh migration network		
Access to safe water		
Bikes owned		
Radios owned		
TVs owned		
Distance to nearest primary school		
Time to nearest health facility		
Distance to nearest major road		
Land owned		

		Cattle Pigs Horses Land operated Access to irrigation Income from farming activities Income from farm sales		
Sampling strategies reported?	2ndary data	We analyze a sample of 1831 rural households from Nicaragua, surveyed in the 2001 Encuesta Nacional de Hogares Sobre Medición de Nivel de Vida, by the Instituto Nacional de Estadísticas y Censos INEC de Nicaragua. Constructed variables used in the analysis were prepared by the Rural Income Generating Activities (RIGA) project team at FAO.		
Sampling sizes reported?	Yes	sample of 1831 rural households		
Data analysis methods reported?	Yes	After accounting for heteroskedasticity through the use of generalized least squares, we estimate vulnerability to food insecurity as the normal probability that the "individual minimum dietary energy requirement under light physical activity" exceeds the expected individual dietary energy consumption (measured in kilocalories). Since the main purpose of this paper is to propose a methodology to analyze and estimate vulnerability, we ignore possible econometric complications that are not directly relevant. However, by all means the results presented here are to be considered preliminary.		

Transparency Assessment Article summary				
Article	Chhinh & Poch (2012)			
Transparent operationalizations	Household characteristics			
Partially transparent				
Not transparent	Current poverty status; environmental shocks; poverty			

Structured summary	of operationaliz	ration – validity assessment	1.1 DCM	1.2 valid	1.	2.
Construct: household	characteristics		Appropriate	empirical	conclusion -	Feasible?
Article: Chhinh & Poch (2012)				rep?	Valid?	
<u>Criterion</u>	<u>Assessment</u>	Quoted text or Rationale for negative assessment				
Construct defined?	Yes	This study adopts the approach to measuring household economic vulnerability posited and elaborated in Chaudhuri's (2003) study of household vulnerability			YES	
Data collection methods reported?	Yes	A total of 600 questionnaires were collected from households.	YES			
Reporting of indicators/questions used to operationalise construct?	Yes	There were on average five people within a household within the surveyed areas. This is well above the national average household size (4.7) in 2008 (NIS, 2008). Rolang Chork has the small- est average household size (4.99 people per household on average) and the highest level of educa- tion among its population (9.6 years of schooling on average). The Kork and Chbar Mon com- munes had larger household sizes than the other selected communes (5.64 and 5.59 people per household on average, respectively). About 60% of respondents reported that their households have at least one motorcycle. There was a large variation in the proportion of households possessing motorcycles between communes, with the Chbar Mon (73%), Peang Lvea (74%) and Rolang Chork (68%) communes having a high- er percentage of motorcycle- possessing households than the Tasal (44%), Kork (50%) and Morhasaing (53%) communes. The survey also revealed that 11.7% of respondents live in households with at least one person with disability. Peang Lvea commune has the highest proportion of households containing a person with a disability		YES		

		(21%), followed by Rolang Chork (13%), Kork (12%), Tasal	
		(11%), Morhasaing (7%) and Chbar Mon (6%).	
Sampling strategies reported?	No		
Sampling sizes reported?	Yes	A total of 600 questionnaires were collected from households.	
Data analysis methods reported?	Yes	The expected log per capita income is estimated using the three-step feasible generalised least squares (FGLS) method. [] Table 3 presents the results of the FGLS analysis. [] Household size, the possession of motor vehicle and a livelihood dependency on agriculture are significantly and inversely associated with log per capita income. Specifically, the larger the household size, the lower the expected log per capita income (the coefficient is -0.182, p<0.001). In addition, the possession of a motor vehicle is positively related to expected per capita income (the coefficient is 0.312, p<0.001); while households who depend on agricultural work alone tend to have lower per capita income than those households who have an additional secondary occupation (the coefficient is -0.899, p<0.001). In addition, the education attainment of respondents has a positive effect on log per capita income, although the effect is small (the coefficient is 0.044, p < 0.001). Access to credit and the presence of person living with disability in the household does not significantly affect log per capita income.	

Transparency Assessment Article	
Article	Dasgupta & Baschieri (2012)
Transparent operationalizations	Drought; human capital; labour; non-labour productive assets; risk of experiencing climate change; social capital
Partially transparent	
Not transparent	

Structured summary	of operationaliz	ration – validity assessment	1.1 DCM	1.2 valid	1.	2.
Construct: Drought			Appropriate	empirical	conclusion -	Feasible?
Article: Dasgupta & B		rep?	Valid?			
<u>Criterion</u>	Assessment	Quoted text or Rationale for negative assessment				
Construct defined?	Yes	We consider the first approach and use deficiency in rainfall as the definition of drought in this study. [] for some, drought is defined as a deficiency in rainfall, or rainfall which is lower than the expected amount in a certain period (van der Ge			NO	
Data collection methods reported?	2ndary data	We used amap fromtheUnited Nations Food and Agriculture Organization (FAO) (2007) showing bands of annual rainfall in Ghana to estimate annual rainfall by region. The regional rankings that we obtain using this definition appear to be confirmed by other studies (Dietz et al., 2004).	NO			
Reporting of indicators/questions used to operationalise construct?	2ndary data			NO		
Sampling strategies reported?	2ndary data				1	
Sampling sizes reported?	2ndary data					

Data analysis	Yes	Alogistic regression model was estimated to investigate		
methods reported?		how(a) the risk of experiencing		
		climate change (measured by the regions ranked by annual		
		rainfall); and (b) poverty status, is associated with		
		vulnerability to climate change, and this is shown in Table 8.		
		Adjusted odds ratios (OR) are also displayed, controlling for		
		either region or poverty status. The dependent variable is		
		vulnerability group. Table 8 shows how as annual rainfall		
		decreases (regions are ranked in order of		
		decreasing rainfall), the crude odds of being in the most		
		vulnerable group tends to increase. That is to say, the odds of		
		being in the most vulnerable group increases as risk of		
		experiencing a climate change shock increases.		

Structured summary of operationalization – validity assessment				1.2 valid	1.	2.
Construct: Human capital			Appropriate	empirical	conclusion -	Feasible?
Article: Dasgupta & B	aschieri (2012)			rep?	Valid?	
<u>Criterion</u>	<u>Assessment</u>	Quoted text or Rationale for negative assessment				
Construct defined?	Yes	The second asset Moser (1998) identified is human capital. Social services that offer education, health care and economic infrastructure for water, transport and electricity help to determine the ability of households to work and to profit from that work.				
Data collection methods reported?	2ndary data	We used data collected between April 1998 and March 1999 by the fourth round of the Ghana Living Standards Survey (GLSS 4), which was funded by theWorld Bank and the Republic of Ghana. The survey instruments were designed to monitor poverty and well- being in Ghana. The GLSS 4 contains information on the demographic characteristics of household members, their reported health status, education, employment, housing and income from wages, business activities and agricultural production and detailed records of consumption and expenditure data. The main data file contained household-level information and derived money- metric measures of poverty such as household income and	CAN'T TELL			

		expenditure (Coulombe and McKay, 2000).		
Reporting of	Yes		level of education of the heads of households	NO	
indicators/questions		and access to	health care as proxies for human capital.		
used to		[]			
operationalise		Education lev	el was treated as binary where the household		
construct?		head either h	ad achieved primary school education or less, or		
		secondary ed	ucation or higher.		
		[]			
			included a variable to capture a household's		
			with increased morbidity in the vulnerability		
			ng that households without access to decent		
			es would be more likely to be affected by		
		-	ge shocks. Data of the existence of health		
			e community were assigned to each		
			e considered the existence of a hospital to be		
			d by that of a clinic. The third and lowest a household with access to neither a hospital		
		nor clinic.			
		[] Table 2			
		ASSETS	Variable		
		Human Capital	Household head education level (N¼3679)		
		Capital	Primary or less		
			Secondary or more		
			Access to an hospital care (N¼3559)		
			No health clinic/hospital		
			Access to a clinic		
			Access to an hospital		
Sampling strategies	Yes	TheGLSS4 is a	two-stage probability-proportional-to-size		
reported?		sample.	<u> </u>		
Sampling sizes	Yes	The sample co	ontains data for5998households, of which 3799		
reported?		resided in rur	al areas, with 25 694 eligible individual		
			embers. We excluded the Greater Accra area as		
			an, leaving 3679 rural households. In addition to		
			d survey, the GLSS 4 team (supervisor and		
			administered a community questionnaire to		
		community le	eaders of the rural enumeration areas that were		

		surveyed. One questionnaire was administered to each of the 195 rural enumeration areas.				
Data analysis methods reported?	Yes	Table 4 shows the weight assigned to each variable derived from the first principal component. The data reduction that PCA performed on the data explained 25 per cent of the original variation of the data. The PCA factor loadings were examined, and the principal component tended to load positively on variables which contributed to lower vulnerability such as better education and better health, and negatively on variables which contributed to higher household vulnerability such as higher percentage of household income from agriculture. Therefore, the score is a measure of 'strength' or preparedness. A high score indicates a non-vulnerable household, and a low score indicates a vulnerable household.				
-	of operationaliz	zation – validity assessment	1.1 DCM Appropriate	1.2 valid	1.	2.
Construct: Labour				empirical	conclusion -	Feasible?
Article: Dasgupta & Baschieri (2012)			_	rep?	Valid?	
<u>Criterion</u>	Assessment	Quoted text or Rationale for negative assessment				
Construct defined?	Yes	The first asset Moser identified is labour			NO	
Data collection methods reported?	2ndary data	We used data collected between April 1998 and March 1999 by the fourth round of the Ghana Living Standards Survey (GLSS 4), which was funded by theWorld Bank and the Republic of Ghana. The survey instruments were designed to monitor poverty and well- being in Ghana. The GLSS 4 contains information on the demographic characteristics of household members, their reported health status, education, employment, housing and income from wages, business activities and agricultural production and detailed records of consumption and expenditure data. The main data file contained household-level information and derived money- metric measures of poverty such as household income and expenditure (Coulombe and McKay, 2000).	CAN'T TELL			
Reporting of indicators/questions used to operationalise	Yes	The primary type of work in which the head of the household was engaged was included into the vulnerability index. This variable was binary, the categories being either in agricultural work or not. The		NO		

construct?		included, wi vulnerable h household in income. [] We also con remittances [] A variable du under 15 or many depen to be contril	of total income derived from agriculture was also ith a high percentage being taken to indicate more nouseholds.We created this variable by dividing ncome from agriculture by the total household isidered the percentage of income derived from etailing the proportion of the household that is over the age of 65 was included, to reflect how indents there are in a household who are less likely buting economically. Finally, we considered the of total household expenditure spent on food.
		ASSETS Labour capital	VariableType of work of household head (N¼3546)Household head works in agricultureHousehold head does not work inagriculturePercent of income that comes fromagriculture (N¼3679)Household income that comes fromremittances (N¼3679)Under 10%Over 10%Percent of household that are dependent(N¼3679)
Sampling strategies reported?	Yes	TheGLSS4 is sample.	a two-stage probability-proportional-to-size
Sampling sizes reported?	Yes	resided in ru	contains data for5998households, of which 3799 ural areas, with 25 694 eligible individual nembers. We excluded the Greater Accra area as

		it is semi-urban, leaving 3679 rural households. In addition to the household survey, the GLSS 4 team (supervisor and enumerator) administered a community questionnaire to community leaders of the rural enumeration areas that were surveyed. One questionnaire was administered to each of the 195 rural enumeration areas.		
Data analysis methods reported?	Yes	Table 4 shows the weight assigned to each variable derived from the first principal component. The data reduction that PCA performed on the data explained 25 per cent of the original variation of the data. The PCA factor loadings were examined, and the principal component tended to load positively on variables which contributed to lower vulnerability such as better education and better health, and negatively on variables which contributed to higher household vulnerability such as higher percentage of household income from agriculture. Therefore, the score is a measure of 'strength' or preparedness. A high score indicates a non-vulnerable household, and a low score indicates a vulnerable household.		

Structured summary of operationalization – validity assessment				1.2 valid	1.	2.
Construct: Non-labour productive assets			Appropriate	empirical	conclusion -	Feasible?
Article: Dasgupta & Baschieri (2012)				rep?	Valid?	
<u>Criterion</u>	Assessment	Quoted text or Rationale for negative assessment				
Construct defined?	Yes	The first asset Moser identified is labour				
Data collection methods reported?	Yes	Non-labour productive assets are the third type. Moser (1998) identified land, sewing machines, radios, refrigerators and motor vehicles as important productive assets for rural households, which can either be used or sold in order to buffer short-term climatic shocks.	CAN'T TELL			
Reporting of indicators/questions used to	2ndary data	We used data collected between April 1998 and March 1999 by the fourth round of the Ghana Living Standards Survey (GLSS 4), which was funded by theWorld Bank and the		YES		

anarationalisa	I	Depublic of Change The survey instruments were designed to
operationalise		Republic of Ghana. The survey instruments were designed to
construct?		monitor poverty and well- being in Ghana. The GLSS 4
		contains information on the demographic characteristics of
		household members, their reported health status, education,
		employment, housing and income from wages, business
		activities and agricultural production and detailed records of
		consumption and expenditure data. The main data file
		contained household-level information and derived money-
		metric measures of poverty such as household income and
		expenditure (Coulombe and McKay, 2000).
Sampling strategies	Yes	In order to measure the different degrees of productive
reported?		assets between households we used the total number of
		productive assets owned by the household as a proxy. Among
		reproducible capital assets the questionnaire included
		furniture, sewing machines, stoves, refrigerator-freezers, air
		conditioners, fans, radios, radio-cassette players, record
		players, three-in-one radio-cassette players, video
		equipment, washing machines, TVs, cameras, electric irons,
		bicycles, motorcycles, cars, houses, land, shares, boats,
		canoes and outboard motors. Each asset was weighted
		equally.
		Table 2
		ASSETS Variable
		Productive Number of productive asset (N¼3679)
		assets
Sampling sizes	Yes	TheGLSS4 is a two-stage probability-proportional-to-size
reported?		sample.
Data analysis	Yes	The sample contains data for5998households, of which 3799
methods reported?		resided in rural areas, with 25 694 eligible individual
		household members. We excluded the Greater Accra area as
		it is semi-urban, leaving 3679 rural households. In addition to
		the household survey, the GLSS 4 team (supervisor and
		enumerator) administered a community questionnaire to
		community leaders of the rural enumeration areas that were
		surveyed. One questionnaire was administered to each of the
	1	
		195 rural enumeration areas.

from the first principal component. The data reduction that PCA performed on the		
data explained 25 per cent of the original variation of the		
data. The PCA factor loadings were examined, and the		
principal component tended to load		
positively on variables which contributed to lower		
vulnerability such as better education and better health, and		
negatively on variables which contributed to higher		
household vulnerability such as higher percentage of		
household income from agriculture. Therefore, the score is a		
measure of 'strength' or preparedness. A high score indicates		
a non-vulnerable household, and a low score indicates a		
vulnerable household.		

Structured summary	of operationaliz	zation – validity assessment	1.1 DCM	1.2 valid	1.	2.
Construct: risk of expe	Construct: risk of experiencing climate change		Appropriate	empirical	conclusion -	Feasible?
Article: Dasgupta & Ba	aschieri (2012)			rep?	Valid?	
<u>Criterion</u>	Assessment	Quoted text or Rationale for negative assessment				
Construct defined?	Yes	We use average annual rainfall data, which serves as a proxy for risk of climate-change-related shock.			NO	
Data collection methods reported?	2ndary data	We used amap fromtheUnited Nations Food and Agriculture Organization (FAO) (2007) showing bands of annual rainfall in Ghana to estimate annual rainfall by region. The regional rankings that we obtain using this definition appear to be confirmed by other studies (Dietz et al., 2004).	NO			
Reporting of indicators/questions used to operationalise construct?	2ndary data			NO		
Sampling strategies reported?	2ndary data				1	
Sampling sizes reported?	2ndary data					
Data analysis	Yes	Alogistic regression model was estimated to investigate			1	

methods reported?		how(a) the risk of experiencing		
		climate change (measured by the regions ranked by annual		
		rainfall); and (b) poverty status, is associated with		
		vulnerability to climate change, and this is shown in Table 8.		
		Adjusted odds ratios (OR) are also displayed, controlling for		
		either region or poverty status. The dependent variable is		
		vulnerability group. Table 8 shows how as annual rainfall		
		decreases (regions are ranked in order of		
		decreasing rainfall), the crude odds of being in the most		
		vulnerable group tends to increase. That is to say, the odds of		
		being in the most vulnerable group increases as risk of		
		experiencing a climate change shock increases.		
	Yes	Table 4 shows the weight assigned to each variable derived		
		from the first principal		
		component. The data reduction that PCA performed on the		
		data explained 25 per cent of the original variation of the		
		data. The PCA factor loadings were examined, and the		
		principal component tended to load		
		positively on variables which contributed to lower		
		vulnerability such as better education and better health, and		
		negatively on variables which contributed to higher		
		household vulnerability such as higher percentage of		
		household income from agriculture. Therefore, the score is a		
		measure of 'strength' or preparedness. A high score indicates		
		a non-vulnerable household, and a low score indicates a		
		vulnerable household.		

Structured summary of operationalization – validity assessment		1.1 DCM	1.2 valid	1.	2.	
Construct: Social capi	tal		Appropriate	empirical	conclusion -	Feasible?
Article: Dasgupta & B	aschieri (2012)			rep? Valid?		
<u>Criterion</u>	Assessment	Quoted text or Rationale for negative assessment	-			
Construct defined?	Yes	Social capital isMoser'sfifth asset as it reduces vulnerability and increases opportunities. Moser and Felton (2007: p. 13) defined social capital as 'the rules, norms, obligations, reciprocity and trust embedded in				

		social relations, social structures and societies' institutional		
		arrangements.' Social capital is generally provided through		
		membership of social networks which can be bonded in a		
		formal or informal nature. Social capital can also be enhanced		
		through social learning and adaptive governance (Olsson et		
		al., 2004; Folke et al., 2005; Pelling and High, 2005; Pelling,		
		2007). Adaptive governance as a dynamic management		
		approach of social-ecological systems has proven itself		
		particularly useful in periods of crisis as it utilises social		
		sources and social learning, drawing on experiences and		
		common understanding and policies of different groups. In		
		the specific context of climate change a number of studies		
		have identified social capital as important in enhancing the		
		community adaptive capacity to climate change (Adger, 2003;		
		van der Geest, 2004; Bryan et al., 2009)		
		[]		
		We consider social capital in its widest sense as social-		
		resource networks, social groups,		
		trust and reciprocity		
Data collection	2ndary data	We used data collected between April 1998 and March 1999	NO	
methods reported?		by the fourth round of the Ghana Living Standards Survey		
		(GLSS 4), which was funded by theWorld Bank and the		
		Republic of Ghana. The survey instruments were designed to		
		monitor poverty and well- being in Ghana. The GLSS 4		
		contains information on the demographic characteristics of		
		household members, their reported health status, education,		
		employment, housing and income from wages, business		
		activities and agricultural production and detailed records of		
		consumption and expenditure data. The main data file		
		contained household-level information and derived money-		
		metric measures of poverty such as household income and		
		expenditure (Coulombe and McKay, 2000).		
Reporting of	Yes	social capital is often considered difficult to operationalise in		NO
indicators/questions		a household survey as it can operate at different levels and		
used to		scales.We used a variable from the community questionnaire		
operationalise		to serve as a proxy. This variable iswhether a system of		
construct?		mutual aid forfieldworkexistedamongthe farmers of		
		thehousehold'scommunity.		

		resource networks, soci trust and reciprocity. For there is a road near the have access, as it can be proxy for the extent to interact with the outsid assistance (Sachs, 2005) community-level data.V main categories: (a) Yes unusable, (c) No road. [] Table 2	or this reason, we also include whether community to which its members e argued that roads are one type of which communities are able to e world and potentially receive). This information was available in the Ve divided this variable into three s, always usable, (b) Yes, sometimes		
		ASSETS Social Capital	VariableSystem of mutual aid amongst farmers (N¼3559)There is a system of mutual aidNo System of mutual aidRoad nearby (N¼3559) No Yes sometime unusable Yes always usable		
Sampling strategies reported?	Yes	-	e probability-proportional-to-size		
Sampling sizes reported?	Yes	resided in rural areas, w household members. W it is semi-urban, leaving the household survey, t enumerator) administer community leaders of t	ta for5998households, of which 3799 vith 25 694 eligible individual /e excluded the Greater Accra area as ; 3679 rural households. In addition to he GLSS 4 team (supervisor and red a community questionnaire to he rural enumeration areas that were maire was administered to each of the areas.		
Data analysis methods reported?	Yes	Table 4 shows the weig from the first principal	ht assigned to each variable derived		

Yes	component. The data reduction that PCA performed on the data explained 25 per cent of the original variation of the data. The PCA factor loadings were examined, and the principal component tended to load positively on variables which contributed to lower vulnerability such as better education and better health, and negatively on variables which contributed to higher household vulnerability such as higher percentage of household income from agriculture. Therefore, the score is a measure of 'strength' or preparedness. A high score indicates a non-vulnerable household, and a low score indicates a vulnerable household. Table 4 shows the weight assigned to each variable derived		
	from the first principal component. The data reduction that PCA performed on the data explained 25 per cent of the original variation of the data. The PCA factor loadings were examined, and the principal component tended to load positively on variables which contributed to lower vulnerability such as better education and better health, and negatively on variables which contributed to higher household vulnerability such as higher percentage of household income from agriculture. Therefore, the score is a measure of 'strength' or preparedness. A high score indicates a non-vulnerable household, and a low score indicates a vulnerable household.		

Transparency Assessment Article s	summary	
Article	Deressa et al (2009)	
Transparent operationalizations	Minimum consumption (income) level	
Partially transparent		
Not transparent		

Structured summary	Structured summary of operationalization – validity assessment			1.2 valid	1.	2. Feasible?
Construct: Minimum	consumption (ir	ncome) level	Appropriate	empirical	conclusion -	
Article: Deressa et al (2009)			rep?	Valid?	
<u>Criterion</u>	<u>Assessment</u>	Quoted text or Rationale for negative assessment				
Construct defined?	Yes	a given minimum level (such as a consumption poverty line)	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell
Data collection methods reported?	n/a	n/a	CAN'T TELL		CAN'T TELL	
Reporting of indicators/questions used to operationalise construct?	Yes	Using the procedures discussed in Section 3 (applied through the STATA software), we estimate the probability of a household falling below a given level of income (poverty line), and perform a sensitivity analysis by examining this probability using four different minimum levels of income (poverty lines). The choice of minimum levels of income is based on different assumptions such as the international poverty line of 1.25 US per day (World Bank, 2008), average income of the surveyed households and arbitrary values above and below the average income of the surveyed households. The results are plotted in Figures 3 to 6. [] Figure 3. Vulnerability (income at 2 USD per day or 6570 Ethiopian Birr per year) plotted against Ln (income) []		CAN'T TELL		

Sampling strategies	n/a	Figure 4. Vulnerability (income at 1.5 USD per day or 4928Ethiopian Birr per year) plotted against Ln (income)[]Figure 5. Vulnerability (income at 1.25 USD per day or4471 Ethiopian Birr per year) plotted against Ln (income)[]Figure 6. Vulnerability (income at 0.3 USD per day or 900Ethiopian Birr per year) plotted against Ln (income)n/a		
reported? Sampling sizes	n/a	n/a		
reported? Data analysis methods reported?	Yes	Using the procedures discussed in Section 3 (applied through the STATA software), we estimate the probability of a household falling below a given level of income (poverty line), and perform a sensitivity analysis by examining this probability using four different minimum levels of income (poverty lines). The choice of minimum levels of income is based on different assumptions such as the international poverty line of 1.25 US per day (World Bank, 2008), average income of the surveyed households and arbitrary values above and below the average income of the surveyed households. The results are plotted in Figures 3 to 6. [] Figure 3. Vulnerability (income at 2 USD per day or 6570 Ethiopian Birr per year) plotted against Ln (income) [] Figure 4. Vulnerability (income at 1.5 USD per day or 4928 Ethiopian Birr per year) plotted against Ln (income) [] Figure 5. Vulnerability (income at 1.25 USD per day or 4471 Ethiopian Birr per year) plotted against Ln (income) [] Figure 6. Vulnerability (income at 0.3 USD per day or 900 Ethiopian Birr per year) plotted against Ln (income)		
	Yes	Table 4 shows the weight assigned to each variable derived from the first principal		

component. The data reduction that PCA performed on		
the data explained 25 per cent of the original variation of		
the data. The PCA factor loadings were examined, and the		
principal component tended to load		
positively on variables which contributed to lower		
vulnerability such as better education and better health,		
and negatively on variables which contributed to higher		
household vulnerability such as higher percentage of		
household income from agriculture. Therefore, the score		
is a measure of 'strength' or preparedness. A high score		
indicates a non-vulnerable household, and a low score		
indicates a vulnerable household.		

Transparency Assessment Article summary				
Article	Eakin et al (2012)			
Transparent operationalizations	Impacts & responses to Hurricane Stan by coffee farmers			
Partially transparent				
Not transparent				

Structured summary of operationalization – validity assessment		1.1 DCM	1.2 valid	1.	2. Feasible?	
Construct: Impacts &	Construct: Impacts & responses to Hurricane Stan by coffee farmers		Appropriate	empirical	conclusion -	
Article: Eakin et al (20	12)			rep?	Valid?	
<u>Criterion</u>	Assessment	Quoted text or Rationale for negative assessment				
Construct defined?	Yes	In this paper, we document household responses to a climatic shock, Stan, to gain insight into how natural resource- dependent communities move to secure their livelihoods following significant loss, the implications of household responses for coffee farming as a "domain of attraction," as well as to highlight those aspects of household choices and perceptions that may be indicative of resilience at broader scales.	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell YES	Yes/ no/ can't tell YES
Data collection methods reported?	Yes	This study is based on 64 household surveys and additional in-depth expert and key-informant interviews, conducted in 2006 and 2007.	YES			
Reporting of indicators/questions used to operationalise construct?	Yes	The surveys, implemented 18 months following Stan, collected information regarding pre- and post-Hurricane Stan activities and income sources, house- hold demographics, land holdings, production attributes, hurricane impacts (to property, production and health and welfare), household assets before and after Stan and access to agricultural and emergency response services. As described later, the survey also captured households' per- ceptions and attitudes about the disaster and their suscep- tibility to damage. [] Table 2 Household assets in 2005 by impact class		YE.		

[[
	Land (in ha) in 2005		
	Percent land in coffee in 2005		
	Number of plots owned in 2005		
	Percentage of these plots in coffee in 2005		
	Coffee production in 2005 (kg)		
	Coffee yields in 2005 (kg/Ha)		
	Percentage of land in riverbed		
	Planted maize (subsistence) in 2005		
	Percentage of households reporting poultry as very		
	important for livelihood in 2005		
	[]		
	Table 3 Impacts of Stan by impact cluster		
	Coffee harvest loss		
	Soil loss		
	Average # of days with difficulty in acquiring basic		
	needs following the hurricane		
	Percentage of households reporting		
	Total damages to the house		
	Loss of coffee production equipment		
	Impacts to their health due to the hurricane		
	[]		
	Table 4 Income profiles pre- and post-Stan (2005 and		
	2007)		
	Percentage of household who received income from		
	Coffee		
	Other crops and/or cattle		
	Agricultural wage laborer		
	Non-farm activities		
	Subsidies, pensions or other governmental support		
	Remittances		
	Number of income sources		
	r 1		
	[]		
	Table 5 Post-Stan actions by impact cluster		

		Bought or rented new landNew land for subsistence crops (maize and/or beans)Invested in soil conservationShifted efforts to a new jobInvested in hurricane protectionPlanted a new cropPlanted shade trees[]Fig. 3 Recovery time for households and the communityfollowing Stan (Household was specifically asked: "Howmuch time do you feel is necessary for your household[community] to fully recover from Stan?" Source:Authors' household survey)		
Sampling strategies reported?	Yes	Three of the most affected communities by Hurricane Stan in the municipio of Siltepec, Vega de Guerrero (pop. 410), Vicente Guerrero (pop. 151) and San Bartolo (pop. 185) were purposely selected for study on the basis of prior experience of one of the investigators in the region.1 Within each community, households were selected using a systematic random sample based on an estimation of the number of coffee producing households and the density of the population in each community. In addition to the surveys, interviews were conducted with community leaders, municipal authorities and local representatives of Civil Protection, the state and federal disaster management agency and the Chiapas Council for Coffee Development and Promotion (Comisio´n para el Desarrollo y Fomento del Cafe´ de Chiapas or COMCAFE). 1 Access to communities for research in Chiapas requires that the researchers have time to develop the necessary trust and collaborative relationships with community members. Because the focus of this research was on a specific disaster event, timeliness was of essence. We thus selected communities for our research that had been significantly affected by the event (as reported in official statistics) and where prior research activities permitted access.		

Sampling sizes reported?	Yes	64 household surveys		
Data analysis methods reported?	Yes	As a heuristic tool to aid in our interpretation of impacts and responses to Stan, we categorized households accord- ing to the exposure of their production systems to Hurri- cane Stan into impact clusters. The impact clusters were created using a two-step cluster method available through the statistical software, PASW 18. Two-step cluster anal- ysis uses a distance criterion (log-likelihood) to define optimal number of clusters and allows for handling a mixture of categorical and (standardized) continuous vari- ables (Zhang et al. 1996; Chiu et al. 2001). [] We used two "loss" variables as the input data for the creation of clusters: percent of coffee harvest and soil lost due to Hurricane Stan. We chose these two variables because of the fundamental economic role played by coffee production for households in Siltepec in 2005. [] We then used these clusters to explore two questions through a descriptive analysis of the remaining survey variables: What were the characteristics of house- holds that experienced specific degrees of loss? What were		
	Yes	their responses?Table 4 shows the weight assigned to each variable derived from the first principal component. The data reduction that PCA performed on the data explained 25 per cent of the original variation of the data. The PCA factor loadings were examined, and the principal component tended to load positively on variables which contributed to lower vulnerability such as better education and better health, and negatively on variables which contributed to higher household vulnerability such as higher percentage of household income from agriculture. Therefore, the score is a measure of 'strength' or preparedness. A high score indicates a non-vulnerable household, and a low score		

indicates a vulnerable household.		
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Transparency Assessment Article summary				
Article	Echevin (2011)			
Transparent operationalizations	Community level; household level			
Partially transparent				
Not transparent				

Structured summary of operationalization – validity assessment		1.1 DCM	1.2 valid	1.	2. Feasible?	
Construct: Communit	Construct: Community level			empirical	conclusion -	
Article: Echevin (2011	.)			rep?	Valid?	
<u>Criterion</u>	<u>Assessment</u>	Quoted text or Rationale for negative assessment				
Construct defined?	Yes	an extension of this empirical framework will consist in	Yes/ no/ can't	Yes/ no/	Yes/ no/	Yes/ no/
		using two-level (i.e. household and community levels)	tell	can't tell	can't tell	can't tell
		modelling of the impact of those shocks following				
		Günther and Harttgen (2009)'s approach.			CAN'T TELL	YES
Data collection	2ndary	The vulnerability and food security survey was conducted	CAN'T TELL			
methods reported?		in Haiti in October and				
		November 2007 on approximately 3,000 households living				
		in 228 rural communities. This survey has been realized				
		by the National Coordination of Food Security Unit with				
		the partnership of the World Food Program. A				
		community-related component was added to the				
		household component of the survey, in connection with				
		infrastructures and accessibility to basic social services.				
Reporting of	Yes	Table 2 presents summary statistics for variables used in		YES		
indicators/questions		the analysis. Consumption and				
used to		income are expressed in Gourdes.				
operationalise		[]				
construct?		The community index is a linear combination of				
		community basic infrastructure and access to market				

		variables (roads, access to elementary or secondary schools, health centres, markets, electricity and cell phone). A score of income diversity has also been built from the various income sources earned by the household. As four main income sources are declared by the household, the income diversity variable (ID) is defined as: $ID_i = (1/2)[1 - \Sigma^{4_{k-1}}(s^k)^2]$ Where s_i^k is the share of the kth income source in total income of household i. This score equals 0 when only one source of income is declared by the household. []Table 2. Descriptive statistics Community variablesAverage years of schooling Land owners Community index
Sampling strategies reported?	2ndary	
Sampling sizes reported?	Yes	3,000 households living in 228 rural communities.
Data analysis methods reported?	Yes	We use self-reported shocks in order to estimate their impact on consumption and income.Table 3 presents OLS estimates and GLLAMM estimates. Both models are estimated with log consumption and log income. Our preferred specification regroups a large set

	an idiosyncratic variance and a covariate variance.		
Yes	Table 4 shows the weight assigned to each variable		
	derived from the first principal		
	component. The data reduction that PCA performed on		
	the data explained 25 per cent of the original variation of		
	the data. The PCA factor loadings were examined, and the		
	principal component tended to load		
	positively on variables which contributed to lower		
	vulnerability such as better education and better health,		
	and negatively on variables which contributed to higher		
	household vulnerability such as higher percentage of		
	household income from agriculture. Therefore, the score		
	is a measure of 'strength' or preparedness. A high score		
	indicates a non-vulnerable household, and a low score		
	indicates a vulnerable household.		

Structured summary of operationalization – validity assessment			1.1 DCM	1.2 valid	1.	2. Feasible?
Construct: household	Construct: household level			empirical	conclusion -	
Article: Echevin (2011	.)			rep?	Valid?	
<u>Criterion</u>	<u>Assessment</u>	Quoted text or Rationale for negative assessment				
Construct defined?	Yes	an extension of this empirical framework will consist in using two-level (i.e. household and community levels) modelling of the impact of those shocks following Günther and Harttgen (2009)'s approach.	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell CAN'T TELL	Yes/ no/ can't tell YES
Data collection methods reported?	2ndary	The vulnerability and food security survey was conducted in Haiti in October and November 2007 on approximately 3,000 households living in 228 rural communities. This survey has been realized by the National Coordination of Food Security Unit with the partnership of the World Food Program. A community-related component was added to the household component of the survey, in connection with infrastructures and accessibility to basic social services.	CAN'T TELL			
Reporting of indicators/questions	Yes	Table 2 presents summary statistics for variables used in the analysis. Consumption and		YES		

				1	
used to		income are expressed in Gourdes. The agricultural in			
operationalise		a composite indicator which is a linear combination of	ot		
construct?		categorical variables obtained from a multiple			
		correspondence analysis (cf. Asselin, 2009). Variable	S		
		considered in the analysis are the number of lands,			
		animals and agricultural materials owned by the			
		household.			
		[]			
		Table 2. Descriptive statistics			
		Household variables			
		Log of consumption			
		Log of income			
		Agricultural index			
		Income diversity			
		Household size			
		Number of children			
		Age of head			
		Male head			
		Years of schooling (head)			
		Activity of head			
		Nojob			
		Agroalimentary			
		Industry			
		Construction			
		Trade			
		Services			
		Other activity			
Sampling strategies reported?	2ndary				
Sampling sizes reported?	Yes	3,000 households living in 228 rural communities.			
Data analysis	Yes	We use self-reported shocks in order to estimate the	eir		
methods reported?		impact on consumption and income.			
		Table 3 presents OLS estimates and GLLAMM estima	tes.		

1				
	Both models are estimated with log consumption and log			
	income. Our preferred specification regroups a large set			
	of explanatory variables such as household			
	characteristics, regional dummies, community			
	characteristics, interaction between household			
	characteristics and community characteristics, shocks			
	variables, interaction between shocks variables and			
	household characteristics, interaction between shocks			
	variables and community characteristics. Estimating the			
	two-level linear random coefficient model (GLLAMM)			
	allows us to decompose the variance of the residuals into			
	an idiosyncratic variance and a covariate variance.			
Yes	Table 4 shows the weight assigned to each variable			
	derived from the first principal			
	component. The data reduction that PCA performed on			
	the data explained 25 per cent of the original variation of			
	the data. The PCA factor loadings were examined, and the			
	principal component tended to load			
	positively on variables which contributed to lower			
	vulnerability such as better education and better health,			
	and negatively on variables which contributed to higher			
	household vulnerability such as higher percentage of			
	household income from agriculture. Therefore, the score			
	is a measure of 'strength' or preparedness. A high score			
	indicates a non-vulnerable household, and a low score			
	indicates a vulnerable household.			
			1	1

Transparency Assessment Article summary			
Article	Gandure et al (2013)		
Transparent operationalizations	Actual meteorological observation		
Partially transparent			
Not transparent	adaptation ot long term climate change; Perception of long term climate change		

Structured summary of operationalization – validity assessment			1.1 DCM	1.2 valid	1.	2. Feasible?
Construct: Actual meteorological observation			Appropriate	empirical	conclusion -	
Article: Gandure et al	(2013)			rep?	Valid?	
<u>Criterion</u>	Assessment	Quoted text or Rationale for negative assessment				
Construct defined?	Yes	actual meteorological observations, rainfall and	Yes/ no/ can't	Yes/ no/	Yes/ no/	Yes/ no/
		temperature data obtained from the South Africa	tell	can't tell	can't tell	can't tell
		Weather Services were analysed. Rainfall and air				
		temperature are routinely measured at various stations			YES	YES, WHERE
		distributed across South Africa, although not all districts				MET
		have weather stations.				STATION
Data collection	2ndary	Rainfall data for our analysis was obtained from the	YES			DATA ARE
methods reported?		station at Thaba Nchu; for temperature; the Bloemfontein				AVAILABLE
		station data was used due to lack of such data for Thaba				
		Nchu. Temperature data for Bloemfontein provided a				
		near representation of climate conditions in Thaba Nchu.				
		Trends of the recorded rainfall and temperature data over				
		the last 49 years (1960–2009) were analysed				
Reporting of	2ndary			-		
indicators/questions						
used to						
operationalise						
construct?						

Sampling strategies	2ndary			
reported?				
Sampling sizes	2ndary			
reported?				
Data analysis	Yes	Rainfall data for Thaba Nchu (Fig. 1) reveals the inter-		
methods reported?		annual variability observed during 1960-		
		2009. During 1960–2009, the district received above		
		mean annual rainfall in half the years. In the other half of		
		the years when there has been below mean average		
		rainfall, the impact on water availability is likely to have		
		been greater. In the three years (2007–2009) prior to data		
		collection, the area has received below mean annual		
		rainfall and these recent experiences are what the		
		community was able to recall easily. Overall, from 1960 to		
		2009, the data does show high inter-annual variability		
		which as it shall be discussed later has been experienced		
		by the farmers. Figs. 2 and 3 show the average daily		
		minimum (June, July, and August) and maximum		
		(December,		
		January, and February) temperatures from 1962–2009,		
		respectively. Over 47 years, on average minimum		
		temperatures display an increasing trend of 1–2 1C during		
		June and July, with the month of June showing the		
		greatestwarming tendencies. Maximum temperatures		
		have remained fairly constant for December and January		
		but have increased slightly for February by approximately		
		1 1Conaverage over thesameperiod.		
	Yes	Table 4 shows the weight assigned to each variable		
		derived from the first principal		
		component. The data reduction that PCA performed on		
		the data explained 25 per cent of the original variation of		
		the data. The PCA factor loadings were examined, and the		
		principal component tended to load		
		positively on variables which contributed to lower		
		vulnerability such as better education and better health,		
		and negatively on variables which contributed to higher		
		household vulnerability such as higher percentage of		
		household income from agriculture. Therefore, the score		

is a measure of 'strength' or preparedness. A high score		
indicates a non-vulnerable household, and a low score		
indicates a vulnerable household.		

Transparency Assessment Article summary						
Article	Günther & Harttgen (2009)					
Transparent operationalizations	Community level; covariate shocks; household level; idiosyncratic shocks; structural poverty					
Partially transparent						
Not transparent						

Structured summary of operationalization – validity assessment			1.1 DCM	1.2 valid empirical	1. conclusion - Valid?	2. Feasible?
Construct: Communit	Construct: Community level					
Article: Günther & Harttgen (2009)				rep?		
<u>Criterion</u>	<u>Assessment</u>	Quoted text or Rationale for negative assessment				
Construct defined?	Yes	Multilevel models are designed to analyze the relationship between variables that are measured at different hierarchical levels (for an introduction see, e Bryk & Raudenbush, 1992; Goldstein, 1999; Hox, 200 We speak of "hierarchical" or "multilevel" data struc	e.g., 2).	Yes/ no/ can't tell	Yes/ no/ can't tell NO	Yes/ no/ can't tell YES
		whenever variables are collected at different hierarch levels with lower-levels (e.g., house- holds) nested wi higher-levels (e.g., communities).	ithin			
Data collection methods reported?	2ndary	The community census is the 2001 ILO/Cornell Comm Level census which covers 1,385 of the 1,395 communities in Mada- gascar. Both surveys do not ha any time dimension.				
Reporting of indicators/questions used to	Yes	Table 1. Summary statistics for households and communities		NO		
operationalise construct?		Table 1. Summary statistics for households and communitiesCommunity characteristics				
		Bus stop (%) Save water (%) Electricity (%) Hospital (%)				

		Market (%)		
		Bank (%)		
		Fertilizer (%)		
		Community road (%)		
		Provincial road (%)		
		National road (%)		
		Secondary education facility (%)		
		Tertiary education facility (%)		
Sampling strategies reported?	2ndary			
Sampling sizes	Yes	2001 ILO/Cornell Commune Level census which covers		
reported?		1,385 of the 1,395 communities in Mada- gascar.		
Data analysis	Yes	To estimate households' expected mean and variance in		
methods reported?		con- sumption, we first use the household characteristics		
		in Table 1. In addition, we consider an agricultural asset		
		index (composed of eight productive assets) estimated via		
		principal component analysis (Filmer & Pritchett, 2001).		
		At the community level, we include population density,		
		mean educational level, the per- centage of households		
		working in the formal sector and the percentage of		
		households possessing an enterprise within the		
		community. Moreover, we construct an infrastructure		
		index, again based on principal component analysis, using		
		fourteen characteristics reflecting the infrastructure of		
		the community (see Table A.4 in Appendix).		
		[]		
		As described in Section 3, we estimate the expected mean		
		and variance per capita household (log) consumption		
		using multilevel modeling. We also decompose the		
		unexplained con- sumption variance into an idiosyncratic		
		(household-level) and a covariate (community-level)		
		component. The regression results of the multilevel		
		model for the esti- mated mean of (log) consumption are		
		presented in Table 2.		I
	Yes	Table 4 shows the weight assigned to each variable		
		derived from the first principal		
		component. The data reduction that PCA performed on		

the data explained 25 per cent of the original variation of		
the data. The PCA factor loadings were examined, and the		
principal component tended to load		
positively on variables which contributed to lower		
vulnerability such as better education and better health,		
and negatively on variables which contributed to higher		
household vulnerability such as higher percentage of		
household income from agriculture. Therefore, the score		
is a measure of 'strength' or preparedness. A high score		
indicates a non-vulnerable household, and a low score		
indicates a vulnerable household.		
mulcates a vullierable nousenold.		

Structured summary of operationalization – validity assessment			1.1 DCM	1.2 valid	1.	2. Feasible?
Construct: Covariate shocks			Appropriate	empirical	conclusion -	
Article: Günther & Ha	rttgen (2009)			rep?	Valid?	
<u>Criterion</u>	<u>Assessment</u>	Quoted text or Rationale for negative assessment				
<u>Criterion</u> Construct defined?	Yes	Households in developing countries are frequently hit by se- vere idiosyncratic and covariate shocks resulting in high income volatility. 1 [] 1. Here, and in the following, idiosyncratic shocks refer to household- specific shocks (e.g., injury, birth, death, or job loss of a household member) that are only weakly correlated across households within a community. Covariate shocks refer to shocks that are correlated across households within communities but only weakly	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell
Data collection methods reported?	2ndary	correlated across communities (e.g., natural disasters or epidemics). Data on household characteristics are taken from the na- tional representative household survey of 2001 (Enque [*] te Aupre [*] s Des Me [*] nages), covering 5,080 households (1,778 ur- ban and 3,302 rural households) in 186 communities.	CAN'T TELL			
		The community census is the 2001 ILO/Cornell Commune Level census which covers 1,385 of the 1,395				

		communities in Mada- gascar. Both surveys do not have	
		any time dimension.	
Reporting of indicators/questions used to operationalise construct?	Yes	More precisely, for each community and for the three years preceding the survey (2001, 2000, 1999) it is reported whether the community was exposed to any of 16 covariate shocks (most of these are reported in Tables A.1 and A.2 in Appendix). [] Table A.1. Households with exposure to shocks	YES
		Malaria Tuberculosis Typhoid Cholera Rice pest Swineflu Newcastle Flooding Impassible bridge or road Drought	
		Cyclones	
Sampling strategies reported?	2ndary		
Sampling sizes reported?	Yes	covering 5,080 households (1,778 ur- ban and 3,302 rural households) in 186 communities [] 2001 ILO/Cornell Commune Level census which covers 1,385 of the 1,395 communities in Mada- gascar.	
Data analysis methods reported?	Yes	The estimated average mean and variance in consumption for the whole sample are presented in Table 3, also separately for rural and urban households. The expected per capita (log) consumption of rural households is below the (log) poverty line, whereas the expected per capita (log) consumption of ur- ban households lies above the (log) poverty line. With regard to the estimated standard deviation in consumption, we show that the estimated standard deviation is slightly higher for rural households than for	

	1			
		urban households, with a standard deviation of 0.58		
		compared to 0.54 (Table 3). Idiosyn- cratic variance is		
		much higher than covariate variance for ur- ban and only		
		slightly higher for rural households. Hence, the relative		
		importance of idiosyncratic variance is much higher for		
		urban than for rural households. More precisely, whereas		
		among urban households the estimated idiosyncratic		
		standard deviation of consumption is 3.25 times as high		
		as covariate standard deviation, the respective rate is		
		only 1.57 for rural households. As a robustness check, we		
		assume that half of the estimated idiosyncratic variance is		
		measurement error. The idiosyncratic standard deviation		
		is still 2.13 as high as covariate standard deviation for		
		urban households and 1.14 as high for rural households		
		(see Table A.3).		
	Yes	Table 4 shows the weight assigned to each variable		
		derived from the first principal		
		component. The data reduction that PCA performed on		
		the data explained 25 per cent of the original variation of		
		the data. The PCA factor loadings were examined, and the		
		principal component tended to load		
		positively on variables which contributed to lower		
		vulnerability such as better education and better health,		
		and negatively on variables which contributed to higher		
		household vulnerability such as higher percentage of		
		household income from agriculture. Therefore, the score		
		is a measure of 'strength' or preparedness. A high score		
		indicates a non-vulnerable household, and a low score		
		indicates a vulnerable household.		
L	1	maloutes a valiferable nousenoid.		

Structured summary of operationalization – validity assessment		1.1 DCM	1.2 valid	1.	2. Feasible?	
Construct: Household level		Appropriate	empirical	conclusion -		
Article: Günther & Harttgen (2009)				rep?	Valid?	
Criterion	<u>Assessment</u>	Quoted text or Rationale for negative assessment				
Construct defined?	Yes	Multilevel models are designed to analyze the	Yes/ no/ can't	Yes/ no/	Yes/ no/	Yes/ no/

Data collection	2ndary	relationship between variables that are measured at different hierarchical levels (for an introduction see, e.g., Bryk & Raudenbush, 1992; Goldstein, 1999; Hox, 2002). We speak of "hierarchical" or "multilevel" data structure whenever variables are collected at different hierarchical levels with lower-levels (e.g., house- holds) nested within higher-levels (e.g., communities). Data on household characteristics are taken from the na-	tell CAN'T TELL	can't tell	can't tell	can't tell
methods reported?	Zhuary	tional representative household survey of 2001 (Enque [*] te Aupre [*] s Des Me [*] nages), covering 5,080 households (1,778 ur- ban and 3,302 rural households) in 186 communities. [] Both surveys do not have any time dimension.				
Reporting of indicators/questions used to operationalise construct?	Yes	Table 1. Summary statistics for households and communitiesTable 1. Summary statistics for households and communitiesHousehold characteristicsAge of HH head (years)Number of childrenFemale headed households (%)Household size Residence (%)Years of schooling of HH headWorks in agriculture (HH head) (%)Works in formal sector (HH head) (%)Works in public sector (HH head) (%)Enterprise owner (%)Land owner (%)Number of cattle		YES		
Sampling strategies reported?	Yes	na- tional representative household survey of 2001				
Sampling sizes reported?	Yes	covering 5,080 households (1,778 ur- ban and 3,302 rural households) in 186 communities				
Data analysis	Yes	To estimate households' expected mean and variance in				

methods reported?		con- sumption, we first use the household characteristics		
		in Table 1. In addition, we consider an agricultural asset		
		index (composed of eight productive assets) estimated via		
		principal component analysis (Filmer & Pritchett, 2001).		
		[]		
		As described in Section 3, we estimate the expected mean		
		and variance per capita household (log) consumption		
		using multilevel modeling. We also decompose the		
		unexplained con- sumption variance into an idiosyncratic		
		(household-level) and a covariate (community-level)		
		component. The regression results of the multilevel		
		model for the esti- mated mean of (log) consumption are		
		presented in Table 2.		
	Yes	Table 4 shows the weight assigned to each variable		
		derived from the first principal		
		component. The data reduction that PCA performed on		
		the data explained 25 per cent of the original variation of		
		the data. The PCA factor loadings were examined, and the		
		principal component tended to load		
		positively on variables which contributed to lower		
		vulnerability such as better education and better health,		
		and negatively on variables which contributed to higher		
		household vulnerability such as higher percentage of		
		household income from agriculture. Therefore, the score		
		is a measure of 'strength' or preparedness. A high score		
		indicates a non-vulnerable household, and a low score		
		indicates a vulnerable household.		

Structured summary of operationalization – validity assessment		1.1 DCM	1.2 valid	1.	2. Feasible?	
Construct: Idiosyncratic shocks		Appropriate	empirical	conclusion -		
Article: Günther & Harttgen (2009)			rep?	Valid?		
<u>Criterion</u>	Assessment	Quoted text or Rationale for negative assessment				
Construct defined?	Yes	Households in developing countries are frequently hit by se- vere idiosyncratic and covariate shocks resulting in high income volatility. 1 []	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell

		1. Here, and in the following, idiosyncratic shocks refer to household- specific shocks (e.g., injury, birth, death, or job loss of a household member) that are only weakly correlated across households within a community. Covariate shocks refer to shocks that are correlated across households within communities but only weakly correlated across communities (e.g., natural disasters or epidemics).		
Data collection methods reported?	2ndary	Data on household characteristics are taken from the na- tional representative household survey of 2001 (Enque [*] te Aupre [*] s Des Me [*] nages), covering 5,080 households (1,778 ur- ban and 3,302 rural households) in 186 communities. The community census is the 2001 ILO/Cornell Commune Level census which covers 1,385 of the 1,395 communities in Mada- gascar. Both surveys do not have any time dimension.	CAN'T TELL	
Reporting of indicators/questions used to operationalise construct?	2ndary			
Sampling strategies reported?	2ndary			
Sampling sizes reported?	Yes	 covering 5,080 households (1,778 ur- ban and 3,302 rural households) in 186 communities [] 2001 ILO/Cornell Commune Level census which covers 1,385 of the 1,395 communities in Mada- gascar. 		
Data analysis methods reported?	Yes	The estimated average mean and variance in consumption for the whole sample are presented in Table 3, also separately for rural and urban households. The expected per capita (log) consumption of rural households is below the (log) poverty line, whereas the expected per capita (log) consumption of ur- ban households lies above the (log) poverty line. With regard to the estimated standard deviation in consumption, we show that the estimated standard		

	deviation is slightly higher for rural households than for		
	urban households, with a standard deviation of 0.58		
	compared to 0.54 (Table 3). Idiosyn- cratic variance is		
	much higher than covariate variance for ur- ban and only		
	slightly higher for rural households. Hence, the relative		
	importance of idiosyncratic variance is much higher for		
	urban than for rural households. More precisely, whereas		
	among urban households the estimated idiosyncratic		
	standard deviation of consumption is 3.25 times as high		
	as covariate standard deviation, the respective rate is		
	only 1.57 for rural households. As a robustness check, we		
	assume that half of the estimated idiosyncratic variance is		
	measurement error. The idiosyncratic standard deviation		
	is still 2.13 as high as covariate standard deviation for		
	urban households and 1.14 as high for rural households		
	(see Table A.3).		
Yes	Table 4 shows the weight assigned to each variable		
	derived from the first principal		
	component. The data reduction that PCA performed on		
	the data explained 25 per cent of the original variation of		
	the data. The PCA factor loadings were examined, and the		
	principal component tended to load		
	positively on variables which contributed to lower		
	vulnerability such as better education and better health,		
	and negatively on variables which contributed to higher		
	household vulnerability such as higher percentage of		
	household income from agriculture. Therefore, the score		
	is a measure of 'strength' or preparedness. A high score		
	indicates a non-vulnerable household, and a low score		
	indicates a vulnerable household.		

Structured summary of operationalization – validity assessment		1.1 DCM	1.2 valid	1.	2. Feasible?	
Construct: Structural poverty		Appropriate	empirical	conclusion -		
Article: Günther & Har	Article: Günther & Harttgen (2009)			rep?	Valid?	
<u>Criterion</u>	<u>Assessment</u>	Quoted text or Rationale for negative assessment				

Construct defined? Data collection methods reported?	Yes 2ndary	 Moreover, these poverty measures cannot assess whether high poverty rates are a cause of structural poverty (i.e., low endowments) or a cause of poverty ri (i.e., high uninsured income fluctuations), which is important to know from a policy perspective. Data on household characteristics are taken from the n tional representative household survey of 2001 (Enque Aupre's Des Me'nages), covering 5,080 households (1,7 ur- ban and 3,302 rural households) in 186 communitie The community census is the 2001 ILO/Cornell Commu 	a- CAN'T TELL ^te 778 s.	Yes/ no/ can't tell	Yes/ no/ can't tell NO	Yes/ no/ can't tell
		Level census which covers 1,385 of the 1,395 communities in Mada- gascar. Both surveys do not hav any time dimension.	e	110		
Reporting of indicators/questions used to operationalise construct?	Yes	Table 1. Summary statistics for households and communitiesTable 1. Summary statistics for households and communitiesHousehold characteristicsAge of HH head (years)Number of childrenFemale headed households (%)Household size Residence (%)Years of schooling of HH headWorks in agriculture (HH head) (%)Works in informal sector (HH head) (%)Works in formal sector (HH head) (%)Works in public sector (HH head) (%)Enterprise owner (%)Land owner (%)Number of cattleCommunity characteristicsBus stop (%)Save water (%)Electricity (%)		NO		

			Г	
		Hospital (%)		
		Market (%)		
		Bank (%)		
		Fertilizer (%)		
		Community road (%)		
		Provincial road (%)		
		National road (%)		
		Secondary education facility (%)		
		Tertiary education facility (%)		
Sampling strategies	2ndary			
reported?	,			
Sampling sizes	Yes	covering 5,080 households (1,778 ur- ban and 3,302 rural		
reported?		households) in 186 communities		
		[]		
		2001 ILO/Cornell Commune Level census which covers		
		1,385 of the 1,395 communities in Mada- gascar.		
Data analysis	Yes	Last, we decompose vulnerability estimates into the		
methods reported?		sources		
		of vulnerability. We first analyze whether vulnerability is		
		mainly driven by permanent low consumption prospects		
		(i.e., structural or poverty induced vulnerability) or by		
		high consumption volatility (i.e., transitory or risk induced		
		vulner- ability). 18 In other words, if the (estimated)		
		expected mean consumption In^		
		a high estimated variance in consumption ^r2		
		mated vulnerability that is greater than the set		
		vulnerability threshold of 0.29, then the household is said		
		to face risk in- duced vulnerability (Figure 1). In Table 4,		
		we see that rural vulnerability is mainly a cause		
		cij lies above the poverty line ln z, but ij leads to an esti-		
		cij of a household already lies below the pov-		
		erty line In z, then the household is referred to as		
		structural or poverty induced vulnerable (Figure 1). If the		
		(estimated) ex- pected consumption In^		
		of low expected mean in consumption whereas urban		
		vulnera- bility is mainly driven by high consumption		
		volatility. More precisely, 67.56% of rural households		

	ve an expected per ca- pita consumption that already s below the poverty line, and "only" 18.13% of rural useholds are vulnerable because of high consumption latility. In contrast, only 7.32% of urban households the structural induced vulnerability, whereas 16.58% the risk induced vulnerability (because of high con- mption fluctuations). Structural induced poverty is nce 3.78 times higher than risk induced poverty across	
	useholds are vulnerable because of high consumption latility. In contrast, only 7.32% of urban households the structural induced vulnerability, whereas 16.58% the risk induced vulnerability (because of high con- mption fluctuations). Structural induced poverty is	
	latility. In contrast, only 7.32% of urban households the structural induced vulnerability, whereas 16.58% the risk induced vulnerability (because of high con- mption fluctuations). Structural induced poverty is	
	te structural induced vulnerability, whereas 16.58% te risk induced vulnerability (because of high con- mption fluctuations). Structural induced poverty is	
	re risk induced vulnerability (because of high con- mption fluctuations). Structural induced poverty is	
	mption fluctuations). Structural induced poverty is	
	ace 3 78 times higher than risk induced poverty across	
	and strottimes higher than hisk induced poverty deross	
	al house- holds. In contrast, urban households face	
	pre often risk in- duced than structural induced poverty	
	e ratio of structural to risk induced poverty is smaller	
	e).	
Yes	ble 4 shows the weight assigned to each variable	
	rived from the first principal	
	mponent. The data reduction that PCA performed on	
	e data explained 25 per cent of the original variation of	
	e data. The PCA factor loadings were examined, and the	
	licates a vulnerable household.	
Yes	e). ble 4 shows the weight assigned to each variable rived from the first principal mponent. The data reduction that PCA performed on a data explained 25 per cent of the original variation of a data. The PCA factor loadings were examined, and the ncipal component tended to load sitively on variables which contributed to lower Inerability such as better education and better health, d negatively on variables which contributed to higher usehold vulnerability such as higher percentage of usehold income from agriculture. Therefore, the score a measure of 'strength' or preparedness. A high score licates a non-vulnerable household, and a low score	-

Transparency Assessment Article s	ummary
Article	Hahn et al (2009)
Transparent operationalizations	2 week illness; agriculture dependend households; average precipitation; borrow-lend ratio; crop diversity; dependency ratio; don't save crops; don't save seeds; family with cronic illness; flood, drought, cyclone events; food from family farm; households with orphans; households working elsewhere; idendependent of local government; inconsistent water suply; injury or death from disaster; inverse water stored; livelihood diversification; malaria exposure-prevention; maximum temperature; minimum temperature; natural water source; no warning of disaster; precent of female-headed households; proximity to health facility; proximity to water source; receive- give ratio; struggle for food; uneducated headed households; water conflict
Partially transparent	
Not transparent	

Structured summary	of operationaliz	zation – validity assessment	1.1 DCM	1.2 valid	1.	2. Feasible?
Construct: 2 week illn	Construct: 2 week illness		Appropriate	empirical	conclusion -	
Article: Hahn et al (20	Article: Hahn et al (2009)			rep?	Valid?	
<u>Criterion</u>	Assessment	Quoted text or Rationale for negative assessment				
Construct defined?	Yes	Percentage of households that report at least 1 family member who had to miss school of work due to illness in the last 2 weeks.	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell
Data collection methods reported?	Yes	household surveys	YES		YES	YES
Reporting of indicators/questions used to operationalise construct?	Yes	Table 1 includes an explanation of how each sub- component was quantified, the survey question used to collect the data, the original source of the survey question, and potential sources of bias. []		YES		
		Table 1 Major components and sub-componentscomprising the Livelihood Vulnerability Index (LVI)developed for two districts of Mozambique.				

					-
		Sub-components	Explanation of	Survey question	
			sub-components		
		Percent of	Percentage of	Has anyone in	
		households	households that	your family	
		where a family	report at least 1	been so sick in	
		member had to	family member	the past 2	
		miss work or	who had to miss	weeks that they	
		school in the	school of work	had to miss	
		last 2 weeks due	due to illness in	work or school?	
		to illness	the last 2 weeks.		
Sampling strategies	Yes	We pilot tested the	LVI and LVI–IPCC in	the Moma and	
reported?		Mabote			
		Districts of Mozambique during 2007. These were			
		selected by CARE-Mozambique as representative of			
		coastal and inland communities, respectively, and the			
		climate change issues con- fronting each.			
		[]			
		Based on a sample size calculation (WHO, 2005) at the			
		95% confidence interval, 🛛 10% precision, 50%			
		prevalence,1 and a design effect of 2 to account for			
		cluster sampling, 200 households in each			
		district were surveyed.2 National 1997 census data that			
		specified the total population in each village was used to			
		select 20 villages in each district using the probability			
		proportional to size method (WHO, 2005; UNICEF, 2008).			
		[]	•		
		1 50% prevalence r	efers to the point pr	evalence of the	
		indicators selected			
		sample size calculat	ions when the prev	alence of the	
		indicators is unknow			
		2 Sample size form	ula: N = DEFF*[(Z2*	p*q)/e2], where N	
		= sample size, DEFF			
		e = 0.10.			
Sampling sizes	Yes	We pilot tested the	LVI and LVI–IPCC in	the Moma and	
reported?		Mabote			
		Districts			
		[]			
		200 households in e	each		
	1	======================			

		district were surveyed.2 National 1997 census data that specified the total population in each village was used to select 20 villages in each district		
Data analysis methods reported?	Yes	The LVI uses a balanced weighted average approach (Sullivanet al., 2002) where each sub-component contributes equally to the overall index even though each major component is comprised of a different number of sub- components. Becausewe intended to develop an assessment tool accessible to a diverse set of users in resource-poor settings, the LVI formula uses the simple approach of applying equal weights to all major components. This weighting scheme could be adjusted by future users as needed. Because each of the sub- 		
	Yes	data from both districts.Table 4 shows the weight assigned to each variable derived from the first principal component. The data reduction that PCA performed on the data explained 25 per cent of the original variation of the data. The PCA factor loadings were examined, and the principal component tended to load positively on variables which contributed to lower vulnerability such as better education and better health, and negatively on variables which contributed to higher household vulnerability such as higher percentage of household income from agriculture. Therefore, the score		

is a measure of 'strength' or preparedness. A high score		
indicates a non-vulnerable household, and a low score		
indicates a vulnerable household.		

Structured summary	of operationaliz	ation – validity asses	ssment		1.1 DCM	1.2 valid	1.	2. Feasible?
Construct: agriculture	dependend ho	useholds			Appropriate	empirical	conclusion -	
Article: Hahn et al (20	09)					rep?	Valid?	
<u>Criterion</u>	Assessment	Quoted text or Rati	onale for negative a	assessment				
Construct defined?	Yes	Percentage of hous source of income.	eholds that report o	only agriculture as a	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't teLL	Yes/ no/ can't tell
Data collection methods reported?	Yes	household surveys			YES		YES	YES
Reporting of indicators/questions used to operationalise construct?	Yes		antified, the survey e original source of ntial sources of bias nponents and sub-c	question used to the survey omponents		YES		
		comprising the Livelihood Vulnerability Index (LVI) developed for two districts of Mozambique.						
		Sub-components	Explanation of sub-components	Survey question				
		Percent of households dependent solely on agriculture as a source of income	Percentage of households that report only agriculture as a source of income.	Do you or someone else in your household raise animals? Do you or someone else in your household grow crops? Do you or someone else in your household collect				

Sampling strategies reported?	Yes	something from the bush, the forest, or lakes and rivers to sell? We pilot tested the LVI and LVI–IPCC in the Moma and Mabote Districts of Mozambique during 2007. These were selected by CARE-Mozambique as representative of coastal and inland communities, respectively, and the climate change issues con- fronting each. []	
		 Based on a sample size calculation (WHO, 2005) at the 95% confidence interval, 10% precision, 50% prevalence, 1 and a design effect of 2 to account for cluster sampling, 200 households in each district were surveyed. 2 National 1997 census data that specified the total population in each village was used to select 20 villages in each district using the probability proportional to size method (WHO, 2005; UNICEF, 2008). [] 1 50% prevalence refers to the point prevalence of the indicators selected for the LVI. This is the default value for sample size calculations when the prevalence of the indicators is unknown. 2 Sample size formula: N = DEFF*[(Z2*p*q)/e2], where N = sample size, DEFF = 2; Z = 1.96 (95% CI), p = 0.5; q = 0.5; e = 0.10. 	
Sampling sizes reported?	Yes	We pilot tested the LVI and LVI–IPCC in the Moma and Mabote Districts [] 200 households in each district were surveyed.2 National 1997 census data that specified the total population in each village was used to select 20 villages in each district	
Data analysis methods reported?	Yes	The LVI uses a balanced weighted average approach (Sullivan	

1			
	et al., 2002) where each sub-component contributes		
	equally to the overall index even though each major		
	component is comprised of a different number of sub-		
	components. Becausewe intended to develop an		
	assessment tool accessible to a diverse set of users in		
	resource-poor settings, the LVI formula uses the simple		
	approach of applying equal weights to all major		
	components. This weighting scheme could be adjusted by		
	future users as needed. Because each of the sub-		
	components is measured on a different		
	scale, it was first necessary to standardize each as an		
	index. The equation used for this conversion was adapted		
	from that used in the Human Development Index to		
	calculate the life expectancy index, which is the ratio of		
	the difference of the actual life expectancy and a pre-		
	selected minimum, and the range of pre- determined		
	maximum and minimum life expectancy (UNDP, 2007):		
	index _{sd} = (S _d - S _{min})/(S _{max} - S _{min})		
	where sd is the original sub-component for district d, and		
	smin and smax are the minimum and maximum values,		
	respectively, for each sub-component determined using		
	data from both districts.		
Yes	Table 4 shows the weight assigned to each variable		
	derived from the first principal		
	component. The data reduction that PCA performed on		
	the data explained 25 per cent of the original variation of		
	the data. The PCA factor loadings were examined, and the		
	principal component tended to load		
	positively on variables which contributed to lower		
	vulnerability such as better education and better health,		
	and negatively on variables which contributed to higher		
	household vulnerability such as higher percentage of		
	household income from agriculture. Therefore, the score		
	is a measure of 'strength' or preparedness. A high score		
	indicates a non-vulnerable household, and a low score		
	indicates a vulnerable household.		
•			

Structured summary of operationalization – validity assessment					1.1 DCM	1.2 valid	1. conclusion	2. Feasible?
Construct: average pr	ecipitation				Appropriate	empirical	- Valid?	
Article: Hahn et al (20	09)					rep?		
Criterion	Assessment	Quoted text or Rati	onale for negative a	assessment				
Construct defined?	d? Yes Standard deviation of the average monthly precipitation Yes/ no/ can't Yes/ no/ Yes					Yes/ no/	Yes/ no/	
		between 1998 and	2003 was averaged	for each province	tell	can't tell	can't tell	can't tell
Data collection	2ndary data	provincial data; we	ather station <mark>based</mark>	in the provincial	CAN'T TELL			
methods reported?		capital	al				YES, BUT	
Reporting of	2ndary data					YES	ONLY FOR	
indicators/questions							AREAS NEAR	
used to		Table 1 Major con	nponents and sub-c	omponents			PROVINCIAL	
operationalise		comprising the Liv	elihood Vulnerabili	ty Index (LVI)			CAPITAL.	
construct?		developed for two	o districts of Mozam	nbique.			GEOGRAPHIC	
		Sub-components	Explanation of	Survey question			VARIABILITY	
			sub-components				UNCLEAR	
		Mean standard	Standard	1998–2003:				
		deviation of	deviation of the	provincial data;				
		average	average	weather station				
		precipitation by	monthly	based in the				
		month	precipitation	provincial				
			between 1998	capital				
			and 2003 was					
			averaged for					
			each province					
Sampling strategies	2ndary data							
reported?								
Sampling sizes	2ndary data							
reported?								
Data analysis	Yes	The LVI uses a bala	nced weighted aver	age approach				
methods reported?		(Sullivan						
		et al., 2002) where	each sub-compone	nt contributes				
		equally to the over	all index even thoug	gh each major				
		component is comp	prised of a different	number of sub-				
		components. Becau	usewe intended to d	levelop an				
		assessment tool ac	cessible to a diverse	e set of users in				

Yes Table 4 shows the weight assigned to each variable derived from the first principal component to the data replacible do lower vulnerability such as higher percentage of household is of the data. The PCA factor loadings were examined, and the principal component on the data higher percentage of household is not runeable household is only and shifted to lower vulnerability such as higher percentage of household.				
Yes Table 4 shows the weight assigned to each variable derived from the first principal Component Step and the original subscience of the original variation of the data explained 25 per cent of the original variation of the data explained to shift per percentage of the original variation of the data explained to shift per percentage of the original variation of the data explained to shift percentage of the original variation of the data from both districts.				
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household vulnerability such as higher percentage of household income from agriculture. Therefore, the score is a measure of 'strength' or preparedness. A high score indicates a non-vulnerable household, and a low scoreImage: Compare the score state s				
household income from agriculture. Therefore, the score is a measure of 'strength' or preparedness. A high score indicates a non-vulnerable household, and a low score				
is a measure of 'strength' or preparedness. A high score indicates a non-vulnerable household, and a low score				
indicates a non-vulnerable household, and a low score		=		
		indicates a vulnerable household.		

Structured summary of operationalization – validity assessment	1.1 DCM	1.2 valid	1.	2. Feasible?
Construct: borrow-lend ratio	Appropriate	empirical	conclusion -	
Article: Hahn et al (2009)		rep?	Valid?	

<u>Criterion</u>	Assessment	Quoted text or Rati	onale for negative a	<u>issessment</u>				
Construct defined?	Yes	Ratio of a househol to a household lend household borrowe ratio = 2:1 or 2 and any, the ratio = 1:2	ding money in the p ed money but did no if they lent money	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell YES	Yes/ no/ can't tell YES	
Data collection methods reported?	Yes	household surveys			YES			
Reporting of indicators/questions used to operationalise construct?	Yes	comprising the Liv	antified, the survey e original source of	question used to the survey omponents ty Index (LVI)		YES		
		(range: 0.5–2)	money in the past month to a household lending money in the past month, e.g., If a household borrowed money but did not lend money, the ratio = 2:1 or 2 and if they lent money but did not borrow any, the ratio = 1:2 or 0.5.	or friends in the past month? Did you lend any money to relatives or friends in the past month?				

Sampling strategies	Yes	We pilot tested the LVI and LVI–IPCC in the Moma and		
reported?		Mabote		
		Districts of Mozambique during 2007. These were		
		selected by CARE-Mozambique as representative of		
		coastal and inland communities, respectively, and the		
		climate change issues con- fronting each.		
		[]		
		Based on a sample size calculation (WHO, 2005) at the		
		95% confidence interval, 210% precision, 50%		
		prevalence,1 and a design effect of 2 to account for		
		cluster sampling, 200 households in each		
		district were surveyed.2 National 1997 census data that		
		specified the total population in each village was used to		
		select 20 villages in each district using the probability		
		proportional to size method (WHO, 2005; UNICEF, 2008).		
		[]		
		1 50% prevalence refers to the point prevalence of the		
		indicators selected for the LVI. This is the default value for		
		sample size calculations when the prevalence of the		
		indicators is unknown.		
		2 Sample size formula: N = DEFF*[(Z2*p*q)/e2], where N		
		= sample size, DEFF = 2; Z = 1.96 (95% CI), p = 0.5; q = 0.5;		
		e = 0.10.		
Sampling sizes	Yes	We pilot tested the LVI and LVI–IPCC in the Moma and		
reported?		Mabote		
•		Districts		
		[]		
		200 households in each		
		district were surveyed.2 National 1997 census data that		
		specified the total population in each village was used to		
		select 20 villages in each district		
Data analysis	Yes	The LVI uses a balanced weighted average approach		
methods reported?		(Sullivan		
-1		et al., 2002) where each sub-component contributes		
		equally to the overall index even though each major		
		component is comprised of a different number of sub-		
		components. Becausewe intended to develop an		
		assessment tool accessible to a diverse set of users in		

r			
	resource-poor settings, the LVI formula uses the simple		
	approach of applying equal weights to all major		
	components. This weighting scheme could be adjusted by		
	future users as needed. Because each of the sub-		
	components is measured on a different		
	scale, it was first necessary to standardize each as an		
	index. The equation used for this conversion was adapted		
	from that used in the Human Development Index to		
	calculate the life expectancy index, which is the ratio of		
	the difference of the actual life expectancy and a pre-		
	selected minimum, and the range of pre- determined		
	maximum and minimum life expectancy (UNDP, 2007):		
	$index_{sd} = (s_d - s_{min})/(s_{max} - s_{min})$		
	where sd is the original sub-component for district d, and		
	smin and smax are the minimum and maximum values,		
	respectively, for each sub-component determined using		
	data from both districts.		
Yes	Table 4 shows the weight assigned to each variable		
	derived from the first principal		
	component. The data reduction that PCA performed on		
	the data explained 25 per cent of the original variation of		
	the data. The PCA factor loadings were examined, and the		
	principal component tended to load		
	positively on variables which contributed to lower		
	vulnerability such as better education and better health,		
	and negatively on variables which contributed to higher		
	household vulnerability such as higher percentage of		
	household income from agriculture. Therefore, the score		
	is a measure of 'strength' or preparedness. A high score		
	indicates a non-vulnerable household, and a low score		
1	indicates a vulnerable household.		

Structured summary of operationalization – validity assessment	1.1 DCM	1.2 valid	1.	2. Feasible?
Construct: crop diversity	Appropriate	empirical	conclusion -	
Article: Hahn et al (2009)		rep?	Valid?	

<u>Criterion</u>	Assessment	Quoted text or Rati	onale for negative a	<u>issessment</u>				
Construct defined?	Yes	The inverse of (the household +1). e.g. maize, nhemba bea Diversity Index = 1/	, A household that g ins, and cassava will	grows pumpkin,	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell YES	Yes/ no/ can't tell YES
Data collection methods reported?	Yes	household surveys	· · ·		YES			
Reporting of indicators/questions used to operationalise construct?	Yes	Table 1 includes an explanation of how each sub- component was quantified, the survey question used to collect the data, the original source of the survey question, and potential sources of bias.[]Table 1 Major components and sub-components comprising the Livelihood Vulnerability Index (LVI)				YES		
		Sub-components	o districts of Mozam Explanation of sub-components	Survey question				
		Average Crop Diversity Index (range: >0–1)a	The inverse of (the number of crops grown by a household +1). e.g., A household that grows pumpkin, maize, nhemba beans, and cassava will have a Crop Diversity	What kind of crops does your household grow?				
Sampling strategies reported?	Yes	We pilot tested the Mabote Districts of Mozaml selected by CARE-N coastal and inland o climate change issu [] Based on a sample						

	1			1
		95% confidence interval, 210% precision, 50%		
		prevalence,1 and a design effect of 2 to account for		
		cluster sampling, 200 households in each		
		district were surveyed.2 National 1997 census data that		
		specified the total population in each village was used to		
		select 20 villages in each district using the probability		
		proportional to size method (WHO, 2005; UNICEF, 2008).		
		[]		
		1 50% prevalence refers to the point prevalence of the		
		indicators selected for the LVI. This is the default value for		
		sample size calculations when the prevalence of the		
		indicators is unknown.		
		2 Sample size formula: N = DEFF*[(Z2*p*q)/e2], where N		
		= sample size, DEFF = 2; Z = 1.96 (95% Cl), p = 0.5; q = 0.5;		
		e = 0.10.		
Sampling sizes	Yes	We pilot tested the LVI and LVI–IPCC in the Moma and		
reported?		Mabote		
		Districts		
		[]		
		200 households in each		
		district were surveyed.2 National 1997 census data that		
		specified the total population in each village was used to		
		select 20 villages in each district		
Data analysis	Yes	The LVI uses a balanced weighted average approach		
methods reported?		(Sullivan		
		et al., 2002) where each sub-component contributes		
		equally to the overall index even though each major		
		component is comprised of a different number of sub-		
		components. Becausewe intended to develop an		
		assessment tool accessible to a diverse set of users in		
		resource-poor settings, the LVI formula uses the simple		
		approach of applying equal weights to all major		
		components. This weighting scheme could be adjusted by		
		future users as needed. Because each of the sub-		
		components is measured on a different		
		scale, it was first necessary to standardize each as an		
		index. The equation used for this conversion was adapted		
		from that used in the Human Development Index to		
	1	nom that used in the Human Development index to		L

	calculate the life expectancy index, which is the ratio of the difference of the actual life expectancy and a pre- selected minimum, and the range of pre- determined maximum and minimum life expectancy (UNDP, 2007): index _{sd} = $(s_d - s_{min})/(s_{max} - s_{min})$ where sd is the original sub-component for district d, and smin and smax are the minimum and maximum values, respectively, for each sub-component determined using data from both districts.		
Yes	Table 4 shows the weight assigned to each variable derived from the first principal component. The data reduction that PCA performed on the data explained 25 per cent of the original variation of the data. The PCA factor loadings were examined, and the principal component tended to load positively on variables which contributed to lower vulnerability such as better education and better health, and negatively on variables which contributed to higher household vulnerability such as higher percentage of household income from agriculture. Therefore, the score is a measure of 'strength' or preparedness. A high score indicates a non-vulnerable household, and a low score indicates a vulnerable household.		

Structured summary	of operationaliz	ation – validity assessment	1.1 DCM	1.2 valid	1.	2. Feasible?
Construct: dependency ratio			Appropriate	empirical	conclusion -	
Article: Hahn et al (2009)				rep?	Valid?	
<u>Criterion</u>	Assessment	Quoted text or Rationale for negative assessment				
Construct defined?	Yes	Ratio of the population under 15 and over 65 years of age to the population between 19 and 64 years of age.	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell
Data collection methods reported?	Yes	household surveys	YES		YES	CAN'T TELL
Reporting of indicators/questions used to	Yes	Table 1 includes an explanation of how each sub- component was quantified, the survey question used to collect the data, the original source of the survey		YES		

oporationalica		question and note	ntial courses of hiss			
operationalise		question, and poter	initial sources of blas			
construct?		[]				
		Table 1 Mais				
			nponents and sub-c			
			elihood Vulnerabili			
		-	o districts of Mozam			
		Sub-components	Explanation of sub-components	Survey question		
		Dependency	Ratio of the	Could you		
		ratio	population	please list the		
			under 15 and	ages and sexes		
			over 65 years of	of every person		
			age to the	who eats and		
			population	sleeps in this		
			between 19 and	house? If you		
			64 years of age.	had a visitor		
				who ate and		
				slept here for		
				the last 3 days,		
				please include		
				them as well.		
Sampling strategies	Yes	We pilot tested the	LVI and LVI–IPCC ir			
reported?		Mabote				
		Districts of Mozaml	bique during 2007. ⁻	These were		
		selected by CARE-M	-			
		coastal and inland o				
		climate change issu				
		[]		-		
		Based on a sample	size calculation (WF	10. 2005) at the		
		95% confidence int				
		prevalence,1 and a				
		cluster sampling, 20	-			
		district were survey				
		specified the total p				
		select 20 villages in		-		
		proportional to size	-			
		[]				
		1 50% prevalence r	efers to the noint n	revalence of the		
<u> </u>		1 30% prevalence h	cicio to the point p			

Sampling sizes reported?	Yes	 indicators selected for the LVI. This is the default value for sample size calculations when the prevalence of the indicators is unknown. 2 Sample size formula: N = DEFF*[(Z2*p*q)/e2], where N = sample size, DEFF = 2; Z = 1.96 (95% CI), p = 0.5; q = 0.5; e = 0.10. We pilot tested the LVI and LVI–IPCC in the Moma and Mabote Districts [] 200 households in each 	
		district were surveyed.2 National 1997 census data that specified the total population in each village was used to select 20 villages in each district	
Data analysis methods reported?	Yes	The LVI uses a balanced weighted average approach (Sullivan et al., 2002) where each sub-component contributes equally to the overall index even though each major component is comprised of a different number of sub- components. Becausewe intended to develop an assessment tool accessible to a diverse set of users in resource-poor settings, the LVI formula uses the simple approach of applying equal weights to all major components. This weighting scheme could be adjusted by future users as needed. Because each of the sub- components is measured on a different scale, it was first necessary to standardize each as an 	

Yes	es	Table 4 shows the weight assigned to each variable		
		derived from the first principal		
		component. The data reduction that PCA performed on		
		the data explained 25 per cent of the original variation of		
		the data. The PCA factor loadings were examined, and the		
		principal component tended to load		
		positively on variables which contributed to lower		
		vulnerability such as better education and better health,		
		and negatively on variables which contributed to higher		
		household vulnerability such as higher percentage of		
		household income from agriculture. Therefore, the score		
		is a measure of 'strength' or preparedness. A high score		
		indicates a non-vulnerable household, and a low score		
		indicates a vulnerable household.		

Structured summary	of operationaliz	ation – validity asse	ssment		1.1 DCM	1.2 valid	1.	2. Feasible?
Construct: don't save	crops				Appropriate	empirical	conclusion -	
Article: Hahn et al (20	09)					rep?	Valid?	
<u>Criterion</u>	Assessment	Quoted text or Rati	onale for negative a	assessment				
Construct defined?	Yes	Percentage of hous each harvest.	eholds that do not	save crops from	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell
Data collection methods reported?	Yes	household surveys	·				YES	CAN'T TELL;
Reporting of indicators/questions used to operationalise construct?	Yes	component was qu collect the data, the	Table 1 includes an explanation of how each sub- component was quantified, the survey question used to collect the data, the original source of the survey question, and potential sources of bias. []			YES		RELEVANCE DEPENDS ON PRODUCTION SYSTEM, THUS NOT A
		comprising the Liv	Table 1 Major components and sub-components comprising the Livelihood Vulnerability Index (LVI) developed for two districts of Mozambique.					
		Sub-components	Explanation of sub-components	Survey question				
		Percent of	Percentage of	Does your				

		households that	households that	family save		
		do not save	do not save	some of the		
		crops	crops from each	crops you		
			harvest.	harvest to eat		
				during a		
				different time		
				of year?		
Sampling strategies reported?	Yes	We pilot tested the Mabote	LVI and LVI–IPCC in	n the Moma and		
•		Districts of Mozam	bique during 2007.	These were		
		selected by CARE-N				
		coastal and inland o				
		climate change issu				
		[]				
		Based on a sample	size calculation (M/	HO 2005) at the		
		95% confidence int				
		prevalence,1 and a	•			
		cluster sampling, 20				
		district were survey				
		specified the total p		-		
		select 20 villages in				
		proportional to size []	e method (WHO, 20	05; UNICEF, 2008).		
		1 50% prevalence r	efers to the point p	revalence of the		
		indicators selected	for the LVI. This is t	he default value		
		for sample size calc	ulations when the	prevalence of the		
		indicators is unknow				
				*p*q)/e2], where N		
				Cl), p = 0.5; q = 0.5;		
		e = 0.10.	,(00,0	- ,, , ,		
Sampling sizes	Yes	We pilot tested the	LVI and LVI–IPCC in	n the Moma and		
reported?		Mabote				
		Districts				
		[]				
		200 households in e	each			
		district were survey		rensus data that		
		specified the total				
		select 20 villages in	•	inage was used to		
		select 20 villages in	each uistfill			

Data analysis	Yes	The LVI uses a balanced weighted average approach		
methods reported?		(Sullivan		
		et al., 2002) where each sub-component contributes		
		equally to the overall index even though each major		
		component is comprised of a different number of sub-		
		components. Becausewe intended to develop an		
		assessment tool accessible to a diverse set of users in		
		resource-poor settings, the LVI formula uses the simple		
		approach of applying equal weights to all major		
		components. This weighting scheme could be adjusted by		
		future users as needed. Because each of the sub-		
		components is measured on a different		
		scale, it was first necessary to standardize each as an		
		index. The equation used for this conversion was adapted		
		from that used in the Human Development Index to		
		calculate the life expectancy index, which is the ratio of		
		the difference of the actual life expectancy and a pre-		
		selected minimum, and the range of pre- determined		
		maximum and minimum life expectancy (UNDP, 2007):		
		$index_{sd} = (s_d - s_{min})/(s_{max} - s_{min})$		
		where sd is the original sub-component for district d, and		
		smin and smax are the minimum and maximum values,		
		respectively, for each sub-component determined using		
		data from both districts.		
	Yes	Table 4 shows the weight assigned to each variable		
	103	derived from the first principal		
		component. The data reduction that PCA performed on		
		the data explained 25 per cent of the original variation of		
		the data. The PCA factor loadings were examined, and		
		the principal component tended to load		
		positively on variables which contributed to lower		
		vulnerability such as better education and better health,		
		and negatively on variables which contributed to higher		
		household vulnerability such as higher percentage of		
		household income from agriculture. Therefore, the score		
		-		
		is a measure of 'strength' or preparedness. A high score		
		indicates a non-vulnerable household, and a low score		
l		indicates a vulnerable household.		

Structured summary	of operationali	zation – validity asses	ssment		1.1 DCM	1.2 valid	1.	2. Feasible?
Construct: don't save	seeds				Appropriate	empirical	conclusion -	
Article: Hahn et al (20	09)					rep?	Valid?	
<u>Criterion</u>	Assessment	Quoted text or Rati	onale for negative a	<u>issessment</u>				
Construct defined?	Yes	Percentage of hous	eholds that do not l	nave seeds from	Yes/ no/ can't	Yes/ no/	Yes/ no/	Yes/ no/
		year to year.			tell	can't tell	can't tell	can't tell
Data collection	Yes	household surveys			YES		YES	YES
methods reported?								
Reporting of	Yes	Table 1 includes an	•			YES		
indicators/questions		component was qu	· · ·	•				
used to		collect the data, the	-	•				
operationalise		question, and poter	ntial sources of bias					
construct?		[]						
					1			
		Table 1 Major components and sub-components comprising the Livelihood Vulnerability Index (LVI)						
		developed for two districts of Mozambique.						
		Sub-components	Explanation of	Survey question				
			sub-components					
		Percent of	Percentage of	Does your				
		households that	households that	family save				
		do not save	do not have	seeds to grow				
		seeds	seeds from year	the next year?				
			to year.				_	
Sampling strategies	Yes	We pilot tested the	LVI and LVI–IPCC in	the Moma and				
reported?		Mabote						
		Districts of Mozambique during 2007. These were						
		selected by CARE-Mozambique as representative of						
		coastal and inland communities, respectively, and the						
		climate change issu	es con- fronting ead	ch.				
		[]						
		Based on a sample size calculation (WHO, 2005) at the						
		95% confidence int						
		prevalence,1 and a	design effect of 2 to	o account for				

	1			1
		cluster sampling, 200 households in each		
		district were surveyed.2 National 1997 census data that		
		specified the total population in each village was used to		
		select 20 villages in each district using the probability		
		proportional to size method (WHO, 2005; UNICEF, 2008).		
		[]		
		1 50% prevalence refers to the point prevalence of the		
		indicators selected for the LVI. This is the default value for		
		sample size calculations when the prevalence of the		
		indicators is unknown.		
		2 Sample size formula: N = DEFF*[(Z2*p*q)/e2], where N		
		= sample size, DEFF = 2; Z = 1.96 (95% Cl), p = 0.5; q = 0.5;		
		e = 0.10.		
Sampling sizes	Yes	We pilot tested the LVI and LVI–IPCC in the Moma and		
reported?		Mabote		
		Districts		
		[]		
		200 households in each		
		district were surveyed.2 National 1997 census data that		
		specified the total population in each village was used to		
		select 20 villages in each district		
Data analysis	Yes	The LVI uses a balanced weighted average approach		
methods reported?	103	(Sullivan		
methous reported:		et al., 2002) where each sub-component contributes		
		equally to the overall index even though each major		
		component is comprised of a different number of sub-		
		components. Becausewe intended to develop an		
		assessment tool accessible to a diverse set of users in		
		resource-poor settings, the LVI formula uses the simple		
		approach of applying equal weights to all major		
		components. This weighting scheme could be adjusted by		
		future users as needed. Because each of the sub-		
		components is measured on a different		
		scale, it was first necessary to standardize each as an		
		index. The equation used for this conversion was adapted		
		from that used in the Human Development Index to		
		calculate the life expectancy index, which is the ratio of		
		the difference of the actual life expectancy and a pre-		

	selected minimum, and the range of pre- determined maximum and minimum life expectancy (UNDP, 2007): index _{sd} = $(s_d - s_{min})/(s_{max} - s_{min})$ where sd is the original sub-component for district d, and smin and smax are the minimum and maximum values, respectively, for each sub-component determined using data from both districts.		
Yes	Table 4 shows the weight assigned to each variable derived from the first principal component. The data reduction that PCA performed on the data explained 25 per cent of the original variation of the data. The PCA factor loadings were examined, and the principal component tended to load positively on variables which contributed to lower vulnerability such as better education and better health, and negatively on variables which contributed to higher household vulnerability such as higher percentage of household income from agriculture. Therefore, the score is a measure of 'strength' or preparedness. A high score indicates a vulnerable household.		

Structured summary	of operationaliz	ation – validity assessment	1.1 DCM	1.2 valid	1.	2. Feasible?
Construct: family with	cronic illness		Appropriate	empirical	conclusion -	
Article: Hahn et al (20	Article: Hahn et al (2009)			rep?	Valid?	
<u>Criterion</u>	Assessment	Quoted text or Rationale for negative assessment				
Construct defined?	Yes	Percentage of households that report at least 1 family member with chronic illness. Chronic illness was defined subjectively by respondent.	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell YES	Yes/ no/ can't tell YES
Data collection methods reported?	Yes	household surveys	YES			
Reporting of indicators/questions used to operationalise	Yes	Table 1 includes an explanation of how each sub- component was quantified, the survey question used to collect the data, the original source of the survey question, and potential sources of bias.		YES		

construct?		[]				
			nponents and sub-c	-		
			elihood Vulnerabili			
			o districts of Mozam			
		Sub-components	Explanation of sub-components	Survey question		
		Percent of households with	Percentage of households that	Is anybody in your family		
		family member	report at least 1	chronically ill		
		with chronic	family member	(they get sick		
		illness	with chronic	very often)?		
			illness. Chronic	very orterij:		
			illness was			
			defined			
			subjectively by			
			respondent.			
Sampling strategies	Yes	We pilot tested the	LVI and LVI–IPCC in	the Moma and		
reported?		Mabote				
		Districts of Mozaml				
		selected by CARE-N				
		coastal and inland o		-		
		climate change issu	es con- fronting ead	ch.		
		[]				
		Based on a sample		-		
		95% confidence int	-			
		prevalence,1 and a				
		cluster sampling, 20				
		district were survey				
		specified the total p		•		
		select 20 villages in proportional to size	-			
			e methoù (WHO, 200	JS, UNICEF, 2006).		
		1 50% prevalence r	efers to the point p	revalence of the		
		indicators selected				
		sample size calculat				
		indicators is unknow	-			
	1		•••••			

		= sample size, DEFF = 2; Z = 1.96 (95% CI), p = 0.5; q = 0.5;		
		e = 0.10.		
Sampling sizes	Yes	We pilot tested the LVI and LVI–IPCC in the Moma and		
reported?		Mabote		
		Districts		
		[]		
		200 households in each		
		district were surveyed.2 National 1997 census data that		
		specified the total population in each village was used to		
		select 20 villages in each district		
Data analysis	Yes	The LVI uses a balanced weighted average approach		
methods reported?		(Sullivan		
		et al., 2002) where each sub-component contributes		
		equally to the overall index even though each major		
		component is comprised of a different number of sub-		
		components. Becausewe intended to develop an		
		assessment tool accessible to a diverse set of users in		
		resource-poor settings, the LVI formula uses the simple		
		approach of applying equal weights to all major		
		components. This weighting scheme could be adjusted by		
		future users as needed. Because each of the sub-		
		components is measured on a different		
		scale, it was first necessary to standardize each as an		
		index. The equation used for this conversion was adapted		
		from that used in the Human Development Index to		
		calculate the life expectancy index, which is the ratio of		
		the difference of the actual life expectancy and a pre-		
		selected minimum, and the range of pre- determined		
		maximum and minimum life expectancy (UNDP, 2007):		
		$index_{sd} = (s_d - s_{min})/(s_{max} - s_{min})$		
		where sd is the original sub-component for district d, and		
		smin and smax are the minimum and maximum values,		
		respectively, for each sub-component determined using		
	Vac	data from both districts.		
	Yes	Table 4 shows the weight assigned to each variable		
		derived from the first principal		
		component. The data reduction that PCA performed on		
		the data explained 25 per cent of the original variation of		

the data. The PCA factor loadings were examined, and the		
principal component tended to load		
positively on variables which contributed to lower		
vulnerability such as better education and better health,		
and negatively on variables which contributed to higher		
household vulnerability such as higher percentage of		
household income from agriculture. Therefore, the score		
is a measure of 'strength' or preparedness. A high score		
indicates a non-vulnerable household, and a low score		
indicates a vulnerable household.		

Structured summary of	of operationaliz	ation – validity as	ssessment		1.1 DCM	1.2 valid	1.	2. Feasible?
Construct: flood, drou	ght, cyclone ev	ents			Appropriate	empirical	conclusion -	
Article: Hahn et al (20	09)					rep?	Valid?	
<u>Criterion</u>	Assessment	Quoted text or F	Rationale for neg	ative assessment				
Construct defined?	Yes		Total number of floods, droughts, and cyclones that were reported by households in the past 6 years.			Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell
Data collection methods reported?	Yes	household surve	eys		YES	YES	YES	YES
Reporting of indicators/questions used to operationalise construct?	Yes	Table 1 includes component was collect the data, question, and po []		YES				
		comprising the	Livelihood Vulne two districts of N					
		components	Explanation of sub- components	Survey question				
		Average number of flood, drought, and	Total number of floods, droughts, and cyclones	How many times has this area been affected by a flood/cyclone/drought				

	and a large	All a All	La 2001 20072				
	cyclone	that were	in 2001–2007?				
	(range: 0–7)	in the past 6					
		years.					
Yes	We pilot tested	the LVI and LVI–	IPCC in the Moma and				
	Mabote						
	Districts of Moza	ambique during 2	2007. These were				
	-		-				
	-		0				
		ole size calculatio	on (WHO 2005) at the				
	-	-					
		•					
			-				
	•		• • •				
		size method (wr	10, 2005; UNICEF, 2008).				
		6					
	-		e prevalence of the				
	-	EFF = 2; Z = 1.96	(95% Cl), p = 0.5; q = 0.5;				
Yes	We pilot tested	the LVI and LVI–	IPCC in the Moma and				
	Mabote						
	Districts						
	[]						
	200 households	in each					
	district were sur	veyed.2 Nationa	l 1997 census data that				
		•					
	-		-				
Yes							
	(Sullivan	5	0 11				
	Yes	events in the past 6 years (range: 0–7)YesWe pilot tested f Mabote Districts of Moza selected by CAR coastal and inlar climate change i [] Based on a samp 95% confidence prevalence,1 and cluster sampling district were sur specified the tot select 20 villages proportional to s [] 1 50% prevalence indicators select sample size calcu indicators is unk 2 Sample size, Di e = 0.10.YesWe pilot tested f Mabote Districts [] 200 households district were sur specified the tot select 20 villages proportional to s []	events in the past 6 years (range: 0–7)reported by households in the past 6 years.YesWe pilot tested the LVI and LVI– Mabote Districts of Mozambique during 2 selected by CARE-Mozambique a coastal and inland communities, climate change issues con- front [] Based on a sample size calculation 95% confidence interval, 10% p prevalence, 1 and a design effect cluster sampling, 200 household district were surveyed.2 National specified the total population in select 20 villages in each district proportional to size method (WH [] 1 50% prevalence refers to the p indicators selected for the LVI. T sample size calculations when the indicators is unknown. 2 Sample size formula: N = DEFF = sample size, DEFF = 2; Z = 1.96 e = 0.10.YesWe pilot tested the LVI and LVI–I Mabote Districts [] 200 households in each district were surveyed.2 National specified the total population in select 20 villages in each district indicators is unknown.	events in the past 6 years (range: 0-7)reported by households in the past 6 years.YesWe pilot tested the LVI and LVI-IPCC in the Moma and Mabote Districts of Mozambique during 2007. These were selected by CARE-Mozambique as representative of coastal and inland communities, respectively, and the climate change issues con- fronting each. [] Based on a sample size calculation (WHO, 2005) at the 95% confidence interval, 10% precision, 50% prevalence, 1 and a design effect of 2 to account for cluster sampling, 200 households in each district were surveyed.2 National 1997 census data that specified the total population in each village was used to select 20 villages in each district using the probability proportional to size method (WHO, 2005; UNICEF, 2008). [] 1 50% prevalence refers to the point prevalence of the indicators selected for the LVI. This is the default value for sample size calculations when the prevalence of the indicators is unknown. 2 Sample size formula: N = DEFF*[(Z2*p*q)/e2], where N = sample size, DEFF = 2; Z = 1.96 (95% CI), p = 0.5; q = 0.5; e = 0.10.YesWe pilot tested the LVI and LVI-IPCC in the Moma and Mabote Districts [] 200 households in each district were surveyed.2 National 1997 census data that specified the total population in each village was used to sample size, DEFF = 2; Z = 1.96 (95% CI), p = 0.5; q = 0.5; e = 0.10.	events in the past 6 years (range: 0-7)reported by households in the past 6 years.YesWe pilot tested the LVI and LVI-IPCC in the Moma and Mabote Districts of Mozambique during 2007. These were selected by CARE-Mozambique as representative of coastal and inland communities, respectively, and the climate change issues con- fronting each. [] Based on a sample size calculation (WHO, 2005) at the 95% confidence interval, IIO% precision, 50% prevalence,1 and a design effect of 2 to account for cluster sampling, 200 households in each district were surveyed.2 National 1997 census data that specified the total population in each village was used to select 20 villages in each district using the probability proportional to size method (WHO, 2005; UNICEF, 2008). [] 1 50% prevalence refers to the point prevalence of the indicators selected for the LVI. 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[] Based on a sample size calculation (WHO, 2005) at the 95% confidence interval, 100% precision, 50% prevalence, 1 and a design effect of 2 to account for cluster sampling, 200 households in each district were surveyed.2 National 1997 census data that specified the total population in each village was used to select 20 villages in each district using the probability proportional to size method (WHO, 2005; UNICEF, 2008). [] 1 50% prevalence refers to the point prevalence of the indicators is unknown. 2 Sample size offermula: N = DEFF*[(22*p*q)/e2], where N = sample size, DEFF = 2; Z = 1.96 (95% CI), p = 0.5; q = 0.5; e = 0.10. Yes We pilot tested the LVI and LVI–IPCC in the Moma and Mabote Districts [] 200 households in each district were surveyed.2 National 1997 census data that specified the total population in each village was used to sample size other formula: N = DEFF*[(22*p*q)/e2], where N = sample size formula: N = DEFF*[(22*p*q)/e2], where N = sample size, DEFF = 2; Z = 1.96 (95% CI), p = 0.5; q = 0.5; e = 0.10.	events in the past 6 years (range: 0-7)reported by households in the past 6 years.YesWe pilot tested the LVI and LVI–IPCC in the Moma and Mabote Districts of Mozambique during 2007. These were selected by CARE-Mozambique as representative of coastal and inland communities, respectively, and the climate change issues con- fronting each. [] Based on a sample size calculation (WHO, 2005) at the 95% confidence interval, 100% precision, 50% prevalence,1 and a design effect of 2 to account for cluster sampling, 200 households in each district were surveyed.2 National 1997 census data that specified the total population in each village was used to select 20 villages in each district using the probability proportional to size method (WHO, 2005; UNICEF, 2008). [] 1 50% prevalence refers to the point prevalence of the indicators selected for the LVI. This is the default value for sample size calculations when the prevalence of the indicators is unknown. 2 Sample size formula: N = DEFF*[(22*p*q)/e2], where N = sample size. DEFF = 2; Z = 1.96 (95% CI), p = 0.5; q = 0.5; e = 0.10.YesWe pilot tested the LVI and LVI–IPCC in the Moma and Mabote Districts [] 200 households in each district were surveyed.2 National 1997 census data that specified the total population in each village was used to select 20 villages in each district were surveyed.2 National 1997 census data that specified the total population in each village was used to select 20 villages in each district were surveyed.2 National 1997 census data that specified the total population in each village was used to select 20 villages in each district

1			
	et al., 2002) where each sub-component contributes		
	equally to the overall index even though each major		
	component is comprised of a different number of sub-		
	components. Becausewe intended to develop an		
	assessment tool accessible to a diverse set of users in		
	resource-poor settings, the LVI formula uses the simple		
	approach of applying equal weights to all major		
	components. This weighting scheme could be adjusted by		
	future users as needed. Because each of the sub-		
	components is measured on a different		
	scale, it was first necessary to standardize each as an		
	index. The equation used for this conversion was adapted		
	from that used in the Human Development Index to		
	calculate the life expectancy index, which is the ratio of		
	the difference of the actual life expectancy and a pre-		
	selected minimum, and the range of pre- determined		
	maximum and minimum life expectancy (UNDP, 2007):		
	index _{sd} = (S _d - S _{min})/(S _{max} - S _{min})		
	where sd is the original sub-component for district d, and		
	smin and smax are the minimum and maximum values,		
	respectively, for each sub-component determined using		
	data from both districts.		
Yes	Table 4 shows the weight assigned to each variable		
	derived from the first principal		
	component. The data reduction that PCA performed on		
	the data explained 25 per cent of the original variation of		
	the data. The PCA factor loadings were examined, and the		
	principal component tended to load		
	positively on variables which contributed to lower		
	vulnerability such as better education and better health,		
	and negatively on variables which contributed to higher		
	household vulnerability such as higher percentage of		
	household income from agriculture. Therefore, the score		
	is a measure of 'strength' or preparedness. A high score		
	indicates a non-vulnerable household, and a low score		
	indicates a vulnerable household.		
•			

Structured summary	of operationaliz	ation – validity asse	ssment		1.1 DCM	1.2 valid	1.	2. Feasible?
Construct: food from	family farm				Appropriate	empirical	conclusion -	
Article: Hahn et al (20	09)					rep?	Valid?	
<u>Criterion</u>	Assessment	Quoted text or Rat	ionale for negative a	assessment .				
Construct defined?	Yes	Percentage of hous from their persona	seholds that get thei I farms	r food primarily	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell
Data collection methods reported?	Yes	household surveys			YES		YES	YES
Reporting of indicators/questions used to operationalise construct?	Yes	component was qu collect the data, th question, and pote []	explanation of how antified, the survey e original source of ntial sources of bias	question used to the survey		YES		
		Table 1 Major components and sub-componentscomprising the Livelihood Vulnerability Index (LVI)developed for two districts of Mozambique.						
		Sub-components	Explanation of sub-components	Survey question				
		Percent of households dependent on family farm for food	Percentage of households that get their food primarily from their personal farms.	Where does your family get most of its food?				
Sampling strategies reported?	Yes	Mabote Districts of Mozam selected by CARE-N coastal and inland climate change issu [] Based on a sample 95% confidence int prevalence,1 and a	bique during 2007. ⁻ Aozambique as repr communities, respe ues con- fronting ead size calculation (WH erval, №10% precision design effect of 2 to 00 households in ea	These were esentative of ctively, and the ch. 10, 2005) at the on, 50% o account for				

		 district were surveyed.2 National 1997 census data that specified the total population in each village was used to select 20 villages in each district using the probability proportional to size method (WHO, 2005; UNICEF, 2008). [] 1 50% prevalence refers to the point prevalence of the indicators selected for the LVI. This is the default value for sample size calculations when the prevalence of the indicators is unknown. 2 Sample size formula: N = DEFF*[(Z2*p*q)/e2], where N = sample size, DEFF = 2; Z = 1.96 (95% CI), p = 0.5; q = 0.5; e = 0.10. 		
Sampling sizes reported?	Yes	We pilot tested the LVI and LVI–IPCC in the Moma and Mabote Districts [] 200 households in each district were surveyed.2 National 1997 census data that specified the total population in each village was used to select 20 villages in each district		
Data analysis methods reported?	Yes	The LVI uses a balanced weighted average approach (Sullivan et al., 2002) where each sub-component contributes equally to the overall index even though each major component is comprised of a different number of sub- components. Becausewe intended to develop an assessment tool accessible to a diverse set of users in resource-poor settings, the LVI formula uses the simple approach of applying equal weights to all major components. This weighting scheme could be adjusted by future users as needed. Because each of the sub- components is measured on a different scale, it was first necessary to standardize each as an index. The equation used for this conversion was adapted from that used in the Human Development Index to calculate the life expectancy index, which is the ratio of the difference of the actual life expectancy and a pre- selected minimum, and the range of pre- determined		

	maximum and minimum life expectancy (UNDP, 2007): index _{sd} = $(s_d - s_{min})/(s_{max} - s_{min})$ where sd is the original sub-component for district d, and smin and smax are the minimum and maximum values, respectively, for each sub-component determined using data from both districts.		
Ye	s Table 4 shows the weight assigned to each variable derived from the first principal component. The data reduction that PCA performed on the data explained 25 per cent of the original variation of the data. The PCA factor loadings were examined, and the principal component tended to load positively on variables which contributed to lower vulnerability such as better education and better health, and negatively on variables which contributed to higher household vulnerability such as higher percentage of household income from agriculture. Therefore, the score is a measure of 'strength' or preparedness. A high score indicates a vulnerable household, and a low score indicates a vulnerable household.		

Structured summary	of operationaliz	zation – validity assessment	1.1 DCM	1.2 valid	1.	2. Feasible?
Construct: household:	s with orphans		Appropriate	empirical	conclusion -	
Article: Hahn et al (2009)				rep?	Valid?	
<u>Criterion</u>	<u>Assessment</u>	Quoted text or Rationale for negative assessment				
Construct defined?	Yes	Percentage of households that have at least 1 orphan living in their home. Orphans are children<18 years old who have lost one or both parents.	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell YES	Yes/ no/ can't tell YES
Data collection methods reported?	Yes	household surveys	YES			
Reporting of indicators/questions used to operationalise construct?	Yes	Table 1 includes an explanation of how each sub- component was quantified, the survey question used to collect the data, the original source of the survey question, and potential sources of bias. []		YES		

			anononto and cub a	ampananta	
		Table 1 Major con			
		comprising the Liv			
		developed for two districts of Mozambique.			
		Sub-components Explanation of Survey question			
		sub-components Percent of Percentage of Are there any			
			-	Are there any	
		households with	households that	children less	
		orphans	have at least 1	than 18 years old from other	
			orphan living in		
			their home.	families living in	
			Orphans are children<18	your house because one or	
				because one or both of their	
			years old who		
			have lost one or both parents.	parents has died?	
Compling strategies	Vac	Ma pilot tostad the			
Sampling strategies reported?	Yes	We pilot tested the LVI and LVI–IPCC in the Moma and			
reporteur		Mabote Districts of Mozambique during 2007. These were			
		selected by CARE-Mozambique as representative of			
		coastal and inland communities, respectively, and the climate change issues con- fronting each.			
		Based on a sample size calculation (WHO, 2005) at the			
		95% confidence interval, 210% precision, 50%			
		prevalence,1 and a design effect of 2 to account for			
		cluster sampling, 200 households in each			
		district were surveyed.2 National 1997 census data that			
		specified the total population in each village was used to			
		select 20 villages in each district using the probability			
		proportional to size	-		
		[]	, , , ,		
		1 50% prevalence r	efers to the point p	revalence of the	
		indicators selected	for the LVI. This is t	he default value for	
		sample size calculat	tions when the prev	alence of the	
		indicators is unknow	•		
		2 Sample size form	ula: N = DEFF*[(Z2*	p*q)/e2], where N	
		= sample size, DEFF	= 2; Z = 1.96 (95% (Cl), p = 0.5; q = 0.5;	

		e = 0.10.		
Sampling sizes reported?	Yes	We pilot tested the LVI and LVI–IPCC in the Moma and Mabote Districts [] 200 households in each district were surveyed.2 National 1997 census data that specified the total population in each village was used to		
		select 20 villages in each district		
Data analysis methods reported?	Yes	The LVI uses a balanced weighted average approach (Sullivan et al., 2002) where each sub-component contributes equally to the overall index even though each major component is comprised of a different number of sub- components. Becausewe intended to develop an assessment tool accessible to a diverse set of users in resource-poor settings, the LVI formula uses the simple approach of applying equal weights to all major components. This weighting scheme could be adjusted by future users as needed. Because each of the sub- components is measured on a different scale, it was first necessary to standardize each as an index. The equation used for this conversion was adapted from that used in the Human Development Index to calculate the life expectancy index, which is the ratio of the difference of the actual life expectancy and a pre- selected minimum, and the range of pre- determined maximum and minimum life expectancy (UNDP, 2007): index _{sd} = $(s_d - S_{min})/(S_{max} - S_{min})$ where sd is the original sub-component for district d, and smin and smax are the minimum and maximum values, respectively, for each sub-component determined using		
	Yes	data from both districts.Table 4 shows the weight assigned to each variable		
		derived from the first principal component. The data reduction that PCA performed on the data explained 25 per cent of the original variation of the data. The PCA factor loadings were examined, and the		

principal component tended to load		
positively on variables which contributed to lower		
vulnerability such as better education and better health,		
and negatively on variables which contributed to higher		
household vulnerability such as higher percentage of		
household income from agriculture. Therefore, the score		
is a measure of 'strength' or preparedness. A high score		
indicates a non-vulnerable household, and a low score		
indicates a vulnerable household.		

Structured summary of operationalization – validity assessment					1.1 DCM	1.2 valid	1.	2. Feasible?
Construct: households	s working elsew	/here			Appropriate	empirical	conclusion -	
Article: Hahn et al (20	09)					rep?	Valid?	
<u>Criterion</u>	Assessment	Quoted text or Rati	onale for negative a	assessment .				
Construct defined?	Yes	Percentage of hous	Percentage of households that report at least 1 family			Yes/ no/	Yes/ no/	Yes/ no/
		member who work	member who works outside of the community for their			can't tell	can't tell	can't tell
		primary work activi	primary work activity.				YES	YES
Data collection methods reported?	Yes	household surveys			YES			
Reporting of indicators/questions used to operationalise construct?	Yes	Table 1 includes an explanation of how each sub- component was quantified, the survey question used to collect the data, the original source of the survey question, and potential sources of bias. []				YES		
		Table 1 Major components and sub-components comprising the Livelihood Vulnerability Index (LVI)						
		developed for two districts of Mozambique.						
		Sub-components	Explanation of	Survey question				
			sub-components					
		Percent of	Percentage of	How many				
		households with	households that	people in your				
		family member	report at least 1	family go to a				
		working in a	family member	different				
		different	who works	community to				

		community	outside of the	work?	
		community	community for	WUIK!	
			-		
			their primary		
<u> </u>			work activity.		
Sampling strategies	Yes	•	e LVI and LVI–IPCC ir	h the Moma and	
reported?		Mabote			
			bique during 2007.		
		-	Nozambique as repr		
			communities, respe		
		_	ues con- fronting ea	ch.	
		[]			
			size calculation (WI		
			terval, 🛛 10% precisio		
		-	a design effect of 2 to		
			00 households in ea		
			yed.2 National 1997		
			population in each v	-	
		-	n each district using		
			e method (WHO, 20	05; UNICEF, 2008).	
		[]			
		-	refers to the point p		
				he default value for	
		-	tions when the prev	alence of the	
		indicators is unkno			
		-	nula: N = DEFF*[(Z2*		
			F = 2; Z = 1.96 (95%	Cl), p = 0.5; q = 0.5;	
		e = 0.10.			
Sampling sizes	Yes	We pilot tested the	e LVI and LVI–IPCC ir	n the Moma and	
reported?		Mabote			
		Districts			
		[]			
		200 households in			
			yed.2 National 1997		
		-	population in each v	village was used to	
		select 20 villages in	n each district		
Data analysis	Yes	The LVI uses a bala	inced weighted aver	age approach	
methods reported?		(Sullivan			
		et al., 2002) where	each sub-compone	nt contributes	

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scale, it was first necessary to standardize each as an index. The equation used for this conversion was adapted from that used in the Human Development Index to calculate the life expectancy index, which is the ratio of the difference of the actual life expectancy and a pre- selected minimum, and the range of pre- determined maximum and minimum life expectancy (UNDP, 2007): index_sd = (sd - Smin)/(Smax - Smin) where sd is the original sub-component for district d, and smin and smax are the minimum and maximum values, respectively, for each sub-component determined using data from both districts.YesTable 4 shows the weight assigned to each variable derived from the first principal
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selected minimum, and the range of pre- determined maximum and minimum life expectancy (UNDP, 2007): indexsd = (Sd - Smin)/(Smax - Smin) where sd is the original sub-component for district d, and smin and smax are the minimum and maximum values, respectively, for each sub-component determined using data from both districts.Image: determined dete
maximum and minimum life expectancy (UNDP, 2007): indexsd = (Sd - Smin)/(Smax - Smin) where sd is the original sub-component for district d, and smin and smax are the minimum and maximum values, respectively, for each sub-component determined using data from both districts.YesTable 4 shows the weight assigned to each variable derived from the first principal
indexsd = (Sd - Smin)/(Smax - Smin) where sd is the original sub-component for district d, and smin and smax are the minimum and maximum values, respectively, for each sub-component determined using data from both districts.Image: Component determined using data from both districts.YesTable 4 shows the weight assigned to each variable derived from the first principalImage: Component determined using derived from the first principal
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data from both districts. data from both districts. Yes Table 4 shows the weight assigned to each variable derived from the first principal
Yes Table 4 shows the weight assigned to each variable derived from the first principal
derived from the first principal
component. The data reduction that PCA performed on
component. The data reduction that FCA performed on
the data explained 25 per cent of the original variation of
the data. The PCA factor loadings were examined, and the
principal component tended to load
positively on variables which contributed to lower
vulnerability such as better education and better health,
and negatively on variables which contributed to higher
household vulnerability such as higher percentage of
household income from agriculture. Therefore, the score
is a measure of 'strength' or preparedness. A high score
indicates a non-vulnerable household, and a low score
indicates a vulnerable household.

Structured summary	Structured summary of operationalization – validity assessment						1.	2. Feasible?
Construct: idendepen	dent of local go	vernment			Appropriate	empirical	conclusion -	
Article: Hahn et al (20	09)					rep?	Valid?	
<u>Criterion</u>	Assessment	Quoted text or Rati	onale for negative a	assessment .				
Construct defined?	Yes	Percentage of hous not asked their loca past 12 months.	•		Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell
Data collection methods reported?	Yes	household surveys			YES		YES	YES
Reporting of indicators/questions used to operationalise construct?	Yes	Table 1 includes an component was qu collect the data, the question, and pote []		YES				
		Table 1 Major components and sub-componentscomprising the Livelihood Vulnerability Index (LVI)developed for two districts of Mozambique.						
		Sub-components	Explanation of sub-components	Survey question				
		Percent of households that have not gone to their local government for assistance in the past 12 months	Percentage of households that reported that they have not asked their local government for any assistance in the past 12 months.	In the past 12 months, have you or someone in your family gone to your community leader for help?				
Sampling strategies reported?	Yes	We pilot tested the LVI and LVI–IPCC in the Moma and Mabote Districts of Mozambique during 2007. These were selected by CARE-Mozambique as representative of coastal and inland communities, respectively, and the climate change issues con- fronting each. [] Based on a sample size calculation (WHO, 2005) at the 95% confidence interval, 10% precision, 50%						

	-		
		prevalence,1 and a design effect of 2 to account for	
		cluster sampling, 200 households in each	
		district were surveyed.2 National 1997 census data that	
		specified the total population in each village was used to	
		select 20 villages in each district using the probability	
		proportional to size method (WHO, 2005; UNICEF, 2008). []	
		1 50% prevalence refers to the point prevalence of the	
		indicators selected for the LVI. This is the default value for	
		sample size calculations when the prevalence of the	
		indicators is unknown.	
		2 Sample size formula: $N = DEFF^{(22*p*q)/e2}$, where N	
		= sample size, DEFF = 2; Z = 1.96 (95% Cl), p = 0.5; q = 0.5; e = 0.10.	
Compling sizes	Yes	We pilot tested the LVI and LVI–IPCC in the Moma and	_
Sampling sizes	162	Mabote	
reported?			
		Districts	
		[]	
		200 households in each	
		district were surveyed.2 National 1997 census data that	
		specified the total population in each village was used to	
<u></u>		select 20 villages in each district	
Data analysis	Yes	The LVI uses a balanced weighted average approach	
methods reported?		(Sullivan	
		et al., 2002) where each sub-component contributes	
		equally to the overall index even though each major	
		component is comprised of a different number of sub-	
		components. Becausewe intended to develop an	
		assessment tool accessible to a diverse set of users in	
		resource-poor settings, the LVI formula uses the simple	
		approach of applying equal weights to all major	
		components. This weighting scheme could be adjusted by	
		future users as needed. Because each of the sub-	
		components is measured on a different	
		scale, it was first necessary to standardize each as an	
		index. The equation used for this conversion was adapted	
		from that used in the Human Development Index to	

	the difference of the actual life expectancy and a pre- selected minimum, and the range of pre- determined maximum and minimum life expectancy (UNDP, 2007): index _{sd} = $(s_d - s_{min})/(s_{max} - s_{min})$ where sd is the original sub-component for district d, and smin and smax are the minimum and maximum values, respectively, for each sub-component determined using data from both districts.		
Yes	 Table 4 shows the weight assigned to each variable derived from the first principal component. The data reduction that PCA performed on the data explained 25 per cent of the original variation of the data. The PCA factor loadings were examined, and the principal component tended to load positively on variables which contributed to lower vulnerability such as better education and better health, and negatively on variables which contributed to higher household vulnerability such as higher percentage of household income from agriculture. Therefore, the score is a measure of 'strength' or preparedness. A high score indicates a vulnerable household. 		

Structured summary	uctured summary of operationalization – validity assessment			1.2 valid	1.	2. Feasible?
Construct: inconsistent water suply		Appropriate	empirical	conclusion -		
Article: Hahn et al (2009)			rep?	Valid?		
<u>Criterion</u>	Assessment	Quoted text or Rationale for negative assessment				
Construct defined?	Yes	Percentage of households that report that water is not available at their primary water source everyday	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell
Data collection methods reported?	Yes	household surveys	YES		YES	YES
Reporting of indicators/questions used to operationalise	Yes	Table 1 includes an explanation of how each sub- component was quantified, the survey question used to collect the data, the original source of the survey question, and potential sources of bias.		YES		

construct?		[]				
		_				
		Table 1 Major con	nponents and sub-c	omponents		
			elihood Vulnerabili			
		developed for two	o districts of Mozam	bique.		
		Sub-components	Explanation of	Survey question		
			sub-components			
		Percent of	Percentage of	Is this water		
		households that	households that	available		
		do not have a	report that	everyday?		
		consistent water	water is not			
		supply	available at their			
			primary water			
• • • • • •			source everyday			
Sampling strategies	Yes	We pilot tested the	LVI and LVI–IPCC in	the Moma and		
reported?		Mabote		- L		
		Districts of Mozam				
		selected by CARE-N				
		coastal and inland of climate change issue	•	-		
			es con- nonting eat			
		Based on a sample	size calculation (M/F	10 2005) at the		
		95% confidence int	•			
		prevalence,1 and a				
		cluster sampling, 20	-			
		district were survey				
		specified the total				
		select 20 villages in	•	-		
		proportional to size	-			
		[]	. ,	· · ·		
		1 50% prevalence r	efers to the point pi	revalence of the		
		indicators selected	for the LVI. This is t	he default value for		
		sample size calculat	tions when the prev	alence of the		
		indicators is unknow	wn.			
			ula: N = DEFF*[(Z2*			
		= sample size, DEFF	= 2; Z = 1.96 (95% (CI), p = 0.5; q = 0.5;		
		e = 0.10.				
Sampling sizes	Yes	We pilot tested the	LVI and LVI-IPCC in	the Moma and		

reported?		Mabote			
		Districts			
		[]			
		200 households in each			
		district were surveyed.2 National 1997 census data that			
		specified the total population in each village was used to			
		select 20 villages in each district			
Data analysis	Yes	The LVI uses a balanced weighted average approach			
	res	(Sullivan			
methods reported?		•			
		et al., 2002) where each sub-component contributes			
		equally to the overall index even though each major			
		component is comprised of a different number of sub-			
		components. Becausewe intended to develop an			
		assessment tool accessible to a diverse set of users in			
		resource-poor settings, the LVI formula uses the simple			
		approach of applying equal weights to all major			
		components. This weighting scheme could be adjusted by			
		future users as needed. Because each of the sub-			
		components is measured on a different			
		scale, it was first necessary to standardize each as an			
		index. The equation used for this conversion was adapted			
		from that used in the Human Development Index to			
		calculate the life expectancy index, which is the ratio of			
		the difference of the actual life expectancy and a pre-			
		selected minimum, and the range of pre- determined			
		maximum and minimum life expectancy (UNDP, 2007):			
		$index_{sd} = (s_d - s_{min})/(s_{max} - s_{min})$			
		where sd is the original sub-component for district d, and			
		smin and smax are the minimum and maximum values,			
		respectively, for each sub-component determined using			
		data from both districts.			
	Yes	Table 4 shows the weight assigned to each variable			
		derived from the first principal			
		component. The data reduction that PCA performed on			
		the data explained 25 per cent of the original variation of			
		the data. The PCA factor loadings were examined, and the			
		principal component tended to load			
		positively on variables which contributed to lower			
<u>.</u>		positively on valuates which contributed to lower		1	

vulnerability such as better education and better health,		
and negatively on variables which contributed to higher		
household vulnerability such as higher percentage of		
household income from agriculture. Therefore, the score		
is a measure of 'strength' or preparedness. A high score		
indicates a non-vulnerable household, and a low score		
indicates a vulnerable household.		

Structured summary of operationalization – validity assessment						1.2 valid	1.	2. Feasible?
Construct: injury or de	eath from disast	ter			Appropriate	empirical	conclusion -	
Article: Hahn et al (20	09)					rep?	Valid?	
<u>Criterion</u>	Assessment	Quoted text or	Rationale for ne	gative assessment				
Construct defined?	Yes	to or death of o	Percentage of households that reported either an injury to or death of one of their family members as a result of the most severe flood, drought, or cyclone in the past 6 years.			Yes/ no/ can't tell	Yes/ no/ can't tell YES	Yes/ no/ can't tell YESS
Data collection methods reported?	Yes	household surv	eys		YES			
Reporting of indicators/questions used to operationalise construct?	Yes	component was collect the data question, and p [] Table 1 Major comprising the	Table 1 includes an explanation of how each sub- component was quantified, the survey question used to collect the data, the original source of the survey question, and potential sources of bias]Table 1 Major components and sub-components comprising the Livelihood Vulnerability Index (LVI) developed for two districts of Mozambique.			YES		
		Sub- components	Explanation of sub- components	Survey question				
		Percent of households with an injury or death as a	Percentage of households that reported	Was anyone in your family injured in the flood/cyclone drought? Did anyone in your family die during the				

result of the most severe most severe injury to or natural death of one disaster in of their flood/cyclone/drought?	
natural death of one	
disaster in of their	
the past 6 family	
years members as	
a result of	
the most	
severe flood,	
drought, or	
cyclone in	
the past 6	
years.	
Sampling strategies Yes We pilot tested the LVI and LVI–IPCC in the Moma and	
reported? Mabote	
Districts of Mozambique during 2007. These were	
selected by CARE-Mozambique as representative of	
coastal and inland communities, respectively, and the	
climate change issues con- fronting each.	
[]	
Based on a sample size calculation (WHO, 2005) at the	
95% confidence interval, 210% precision, 50%	
prevalence, 1 and a design effect of 2 to account for	
cluster sampling, 200 households in each	
district were surveyed.2 National 1997 census data that	
specified the total population in each village was used to	
select 20 villages in each district using the probability	
proportional to size method (WHO, 2005; UNICEF, 2008).	
1 50% prevalence refers to the point prevalence of the	
indicators selected for the LVI. This is the default value for	
sample size calculations when the prevalence of the	
indicators is unknown.	
2 Sample size formula: N = DEFF*[(Z2*p*q)/e2], where N	
= sample size, DEFF = 2; Z = 1.96 (95% Cl), p = 0.5; q = 0.5;	
e = 0.10.	
Sampling sizes Yes We pilot tested the LVI and LVI–IPCC in the Moma and	
reported? Mabote	

		Districts []	 		
		200 households in each			
		district were surveyed.2 National 1997 census data that			
		specified the total population in each village was used to			
		select 20 villages in each district			
Data analysis	Yes	The LVI uses a balanced weighted average approach			
methods reported?		(Sullivan			
		et al., 2002) where each sub-component contributes			
		equally to the overall index even though each major			
		component is comprised of a different number of sub-			
		components. Becausewe intended to develop an			
		assessment tool accessible to a diverse set of users in			
		resource-poor settings, the LVI formula uses the simple			
		approach of applying equal weights to all major			
		components. This weighting scheme could be adjusted by			
		future users as needed. Because each of the sub-			
		components is measured on a different			
		scale, it was first necessary to standardize each as an			
		index. The equation used for this conversion was adapted			
		from that used in the Human Development Index to			
		calculate the life expectancy index, which is the ratio of			
		the difference of the actual life expectancy and a pre-			
		selected minimum, and the range of pre- determined			
		maximum and minimum life expectancy (UNDP, 2007):			
		$index_{sd} = (S_d - S_{min})/(S_{max} - S_{min})$			
		where sd is the original sub-component for district d, and			
		smin and smax are the minimum and maximum values,			
		respectively, for each sub-component determined using			
		data from both districts.			
<u> </u>	Yes	Table 4 shows the weight assigned to each variable		<u> </u>	
		derived from the first principal			
		component. The data reduction that PCA performed on			
		the data explained 25 per cent of the original variation of			
		the data. The PCA factor loadings were examined, and the			
		principal component tended to load			
		positively on variables which contributed to lower			
		vulnerability such as better education and better health,			

and negatively on variables which contributed to higher		
household vulnerability such as higher percentage of		
household income from agriculture. Therefore, the score		
is a measure of 'strength' or preparedness. A high score		
indicates a non-vulnerable household, and a low score		
indicates a vulnerable household.		

r stored) Assessment (es (es	•	average number of		Appropriate Yes/ no/ can't	empirical rep? Yes/ no/	conclusion - Valid?	
Assessment /es /es	The inverse of (the stored by each hous	average number of		Yes/ no/ can't			
/es	The inverse of (the stored by each hous	average number of		Yes/ no/ can't	Ves/no/		
/es	stored by each hous	•	liters of water	Yes/ no/ can't	Ves/no/		
	household surveys		The inverse of (the average number of liters of water stored by each household + 1).			Yes/ no/ can't tell	Yes/ no/ can't tell
/es	nousehold surveys			YES		YES	YES
	Sub-components Inverse of the average number of liters of water stored per household (range: >0–1)		YES				
/es	Mabote						
/es	3	developed for two Sub-components Inverse of the average number of liters of water stored per household (range: >0–1) We pilot tested the Mabote	developed for two districts of MozamSub-componentsExplanation of sub-componentsInverse of the average numberThe inverse of (the average of liters of water stored per household (range: >0-1)The inverse of by each household + 1).SWe pilot tested the LVI and LVI–IPCC in Mabote	developed for two districts of Mozambique.Sub-componentsExplanation of sub-componentsSurvey questionInverse of the average numberThe inverse of (the average number of liters of water stored per household (range: >0-1)What containers do you usually household + 1).we pilot tested the LVI and LVI–IPCC in the Moma and MaboteWe pilot tested the LVI and LVI–IPCC in the Moma and Mabote	developed for two districts of Mozambique. Sub-components Explanation of sub-components Survey question Inverse of the average number of liters of water The inverse of (the average) What containers do you usually of liters of water number of liters store water in? stored per of water stored How many? household by each How many liters (range: >0-1) household + 1). are they? we pilot tested the LVI and LVI–IPCC in the Moma and Mabote Mabote	developed for two districts of Mozambique. Sub-components Explanation of sub-components Survey question Inverse of the average number The inverse of (the average What containers do you usually of liters of water number of liters store water in? stored per of water stored How many? household by each How many liters (range: >0-1) household + 1). are they? we pilot tested the LVI and LVI–IPCC in the Moma and Mabote Mabote	developed for two districts of Mozambique. Sub-components Explanation of sub-components Inverse of the average number The inverse of do you usually do you usually of liters of water number of liters stored per of water stored household by each How many liters (range: >0-1) household + 1). are they?

	prevalence,1 and a design effect of 2 to account for				
	cluster sampling, 200 households in each				
	district were surveyed.2 National 1997 census data that				
	specified the total population in each village was used to				
	select 20 villages in each district using the probability				
	proportional to size method (WHO, 2005; UNICEF, 2008).				
	[]				
	1 50% prevalence refers to the point prevalence of the				
	indicators selected for the LVI. This is the default value for				
	sample size calculations when the prevalence of the				
	indicators is unknown.				
	2 Sample size formula: N = DEFF*[(Z2*p*q)/e2], where N				
	= sample size, DEFF = 2; Z = 1.96 (95% Cl), p = 0.5; q = 0.5;				
	e = 0.10.				
Yes	We pilot tested the LVI and LVI–IPCC in the Moma and				
	Mabote				
	Districts				
	[]				
	200 households in each				
	district were surveyed.2 National 1997 census data that				
	specified the total population in each village was used to				
	select 20 villages in each district				
Yes	The LVI uses a balanced weighted average approach				
	(Sullivan				
	et al., 2002) where each sub-component contributes				
	equally to the overall index even though each major				
	component is comprised of a different number of sub-				
	components. Becausewe intended to develop an				
	assessment tool accessible to a diverse set of users in				
	resource-poor settings, the LVI formula uses the simple				
	approach of applying equal weights to all major				
		proportional to size method (WHO, 2005; UNICEF, 2008).[]1 50% prevalence refers to the point prevalence of the indicators selected for the LVI. This is the default value for sample size calculations when the prevalence of the indicators is unknown.2 Sample size formula: N = DEFF*[(Z2*p*q)/e2], where N = sample size, DEFF = 2; Z = 1.96 (95% Cl), p = 0.5; q = 0.5; e = 0.10.YesWe pilot tested the LVI and LVI–IPCC in the Moma and Mabote Districts [] 200 households in each district were surveyed.2 National 1997 census data that specified the total population in each village was used to select 20 villages in each districtYesThe LVI uses a balanced weighted average approach (Sullivan et al., 2002) where each sub-component contributes equally to the overall index even though each major component is comprised of a different number of sub- components. Becausewe intended to develop an assessment tool accessible to a diverse set of users in resource-poor settings, the LVI formula uses the simple	coastal and inland communities, respectively, and the climate change issues con- fronting each. []Based on a sample size calculation (WHO, 2005) at the 95% confidence interval, @10% precision, 50% prevalence,1 and a design effect of 2 to account for cluster sampling, 200 households in each district were surveyed.2 National 1997 census data that specified the total population in each village was used to select 20 villages in each district using the probability proportional to size method (WHO, 2005; UNICEF, 2008). []110% prevalence refers to the point prevalence of the indicators selected for the LVI. This is the default value for sample size calculations when the prevalence of the indicators is unknown. 2 Sample size, DEFF = 2; Z = 1.96 (95% CI), p = 0.5; q = 0.5; e = 0.10.YesWe pilot tested the LVI and LVI-IPCC in the Moma and Mabote Districts [] 200 households in each district were surveyed.2 National 1997 census data that specified the total population in each village was used to select 20 villages in each districtYesThe LVI uses a balanced weighted average approach (Sullivan et al., 2002) where each sub-component contributes equally to the overall index even though each major components. Becausewe intended to develop an assessment tool accessible to a diverse set of users in resource-poor settings, the LVI formula uses the simple	coastal and inland communities, respectively, and the climate change issues con- fronting each. []Based on a sample size calculation (WHO, 2005) at the 95% confidence interval, 10% precision, 50% prevalence, 1 and a design effect of 2 to account for cluster sampling, 200 households in each district were surveyed.2 National 1997 census data that specified the total population in each village was used to select 20 villages in each district using the probability proportional to size method (WHO, 2005; UNICEF, 2008). [] 1 50% prevalence refers to the point prevalence of the indicators selected for the LVI. 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	future users as needed. Because each of the sub-		
	components is measured on a different		
	scale, it was first necessary to standardize each as an		
	index. The equation used for this conversion was adapted		
	from that used in the Human Development Index to		
	calculate the life expectancy index, which is the ratio of		
	the difference of the actual life expectancy and a pre-		
	selected minimum, and the range of pre- determined		
	maximum and minimum life expectancy (UNDP, 2007):		
	$index_{sd} = (s_d - s_{min})/(s_{max} - s_{min})$		
	where sd is the original sub-component for district d, and		
	smin and smax are the minimum and maximum values,		
	respectively, for each sub-component determined using		
	data from both districts.		
Yes	Table 4 shows the weight assigned to each variable		
	derived from the first principal		
	component. The data reduction that PCA performed on		
	the data explained 25 per cent of the original variation of		
	the data. The PCA factor loadings were examined, and the		
	principal component tended to load		
	positively on variables which contributed to lower		
	vulnerability such as better education and better health,		
	and negatively on variables which contributed to higher		
	household vulnerability such as higher percentage of		
	household income from agriculture. Therefore, the score		
	is a measure of 'strength' or preparedness. A high score		
	indicates a non-vulnerable household, and a low score		
	indicates a vulnerable household.		

Structured summary of operationalization	ation – validity a	assessment
Construct: livelihood diversification		
Article: Hahn et al (2009)		
Criterion	<u>Assessment</u>	Quoted text or Rationale for negative assessment

Structured summary	of operationaliz	zation – validity asses	ssment		1.1 DCM	1.2 valid	1.	2. Feasible?
Construct: livelihood of	diversification				Appropriate	empirical	conclusion -	
Article: Hahn et al (20	09)					rep?	Valid?	
<u>Criterion</u>	<u>Assessment</u>	Quoted text or Rati	onale for negative a	<u>ssessment</u>				
Construct defined?	Yes	The inverse of (the	number of agricultu	ral livelihood	Yes/ no/ can't	Yes/ no/	Yes/ no/	Yes/ no/
		activities +1) report			tell	can't tell	can't tell	can't tell
	that farms, raises animals, and collects natural resource							YES
will have a Livelihood Diversification Index = 1/(3 + 1) =				dex = 1/(3 + 1) =			YES	
		0.25.				_		
Data collection methods reported?	Yes	household surveys		YES				
Reporting of	Yes		explanation of how		YES			
indicators/questions		component was qu						
used to		collect the data, the	-	•				
operationalise		question, and potential sources of bias.						
construct?		[]						
		Table 1 Major components and sub-components						
		comprising the Livelihood Vulnerability Index (LVI)						
			districts of Mozam					
		Sub-components	Explanation of	Survey question				
		A	sub-components	Daviau an				
		Average	The inverse of (the number of	Do you or				
		Agricultural Livelihood	agricultural	someone else in your household				
		Diversification	livelihood	raise animals?				
		Index (range:	activities +1)	Do you or				
		0.20–1)a	reported by a	someone else in				
		0.20 1/0	household, e.g.,	your household				
			A household	grow crops? Do				
			that farms,	you or someone				
			raises animals,	else in your				
			and collects	household				
			natural	collect				
			resources will	something from				
			have a	the bush, the				

			Livelihood Diversification Index = $1/(3 + 1)$ = 0.25.	forest, or lakes and rivers to sell?	
Sampling strategies reported?	Yes	Mabote Districts of Mozaml selected by CARE-N coastal and inland of climate change issue [] Based on a sample 95% confidence int prevalence,1 and a cluster sampling, 20 district were survey specified the total p select 20 villages in proportional to size [] 1 50% prevalence r indicators selected sample size calcular indicators is unknow 2 Sample size form	LVI and LVI–IPCC in bique during 2007. T Aozambique as repre- communities, respec- tes con- fronting eac size calculation (WH erval, 10% precisio design effect of 2 to 20 households in eac ved.2 National 1997 population in each v each district using t e method (WHO, 200 effers to the point pr for the LVI. This is the tions when the prev- wn. ula: N = DEFF*[(Z2* f = 2; Z = 1.96 (95% C	These were esentative of trively, and the h. (O, 2005) at the n, 50% o account for ch census data that illage was used to the probability (D5; UNICEF, 2008). revalence of the ne default value for alence of the p*q)/e2], where N	
Sampling sizes reported?	Yes	Mabote Districts [] 200 households in o district were survey	ved.2 National 1997 population in each v	census data that	
Data analysis methods reported?	Yes	The LVI uses a bala (Sullivan	nced weighted avera		

Yes Yes Yes Y				
Yes Table 4 shows the weight assigned to each variable Yes Table 4 shows the weight assigned to each variable Yes Table 4 shows the weight assigned to each variable Yes Table 4 shows the weight assigned to load Yes Table 4 shows the weight assigned to load Yes Table 4 shows the weight assigned to load Yes Table 4 shows the weight assigned to load Yes Table 4 shows the weight assigned to load Yes Table 4 shows the weight assigned to load Yes Table 4 shows the weight assigned to load Yes Table 4 shows the weight assigned to load Yes Table 4 shows the weight assigned to load Yes Table 4 shows the weight assigned to load Yes Table 4 shows the weight assigned to load Yes Table 4 shows the weight assigned to load Yes Table 4 shows the weight assigned to load Yes Table 4 shows the weight assigned to load Yes Table 4 shows the weight assigned to load Yes Table 4 shows the weight assigned to load Yes Table 4 shows the weight assigned to load Yes Table 4 shows the weight assigned to load				
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Yes Table 4 shows the weight asigned to each variable Yes Table 4 shows the weight asigned to each variable definition Yes Table 4 shows the weight asigned to each variable definition of the data reduction the first principal component. The data reduction the to reduct the rest of the data. The equation used for this conversion was adapted for the difference of the actual life expectancy index, which is the ratio of the difference of the actual life expectancy and a preselected minimum, and the range of pre- determined maximum and minimum life expectancy (UNDP, 2007): index.g (signed to each wait) data from both districts. Yes Table 4 shows the weight assigned to each variable derived from the first principal component. The data reduction that PCA performed on the data. The PCA factor loading swere examined, and the principal component tended to load positively on variables which contributed to lower vulnerability such as higher percentage of household vulnerability such a		components. Becausewe intended to develop an		
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Yes Table 4 shows the weight assigned to each variable derived from the first principal component is main and mainter assigned to each variable derived from the first principal component first principal data explained 25 per cent of the organ variables which contributed to load principal contributed to load		resource-poor settings, the LVI formula uses the simple		
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YesYesYesTable 4 shows the weight assigned to each variable derived from the first principal component. The data reduction that PCA performed on the data reduction that PCA performed on the data subject of the source sale to he data subject of the data subject on variables which contributed to lower vulnerability such as higher percentege of household uncereduction and better health, and negatively on variables which contributed to higher household uncereduction and better health, and negatively on variables which contributed to higher household uncereduction and better health, and negatively on variables which contributed to higher household uncereduction and better health, and negatively on variables which contributed to higher household uncereduction and better health, and negatively on variables which contributed to higher household uncereduction and better health, and negatively on variables which contributed to higher household uncereduction and better health, and negatively on variables which contributed to higher household uncereduction and better health, and negatively on variables which contributed to higher household uncereduction and better health, and negatively on variables which contributed to higher household uncereduction and better health, and negatively on variables which contributed to higher household uncereduction and better health, and negatively on variables which contributed to higher household uncereduction and better health, and negatively on variables which contributed to higher household uncereduction and better health, and negatively on variables which contributed to higher household uncereduction and better health, and negatively on variables which contributed to higher household uncereduction and better health, and negatively on variables which contributed to higher household uncered		components. This weighting scheme could be adjusted by		
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index. The equation used for this conversion was adapted from that used in the Human Development Index to calculate the life expectancy index, which is the ratio of the difference of the actual life expectancy and a pre- selected minimum, and the range of pre- determined maximum and minimum life expectancy (UNDP, 2007): indexsd = (sa - Smin)/(Smar - Smin) where sd is the original sub-component for district d, and smin and smax are the minimum and maximum values, respectively, for each sub-component determined using data from both districts.YesTable 4 shows the weight assigned to each variable derived from the first principal component. The data reduction that PCA performed on the data. The PCA factor loadings were examined, and the principal component tended to load positively on variables which contributed to lower vulnerability such as better education and better health, and negatively on variables which contributed to higher household uncerability such as higher percentage of household uncerability or paraedness. A high score		components is measured on a different		
from that used in the Human Development Index to calculate the life expectancy index, which is the ratio of the difference of the actual life expectancy and a pre- selected minimum, and the range of pre- determined maximum and minimum life expectancy (UNDP, 2007): indexd = (sa - Smin)/(Smax - Smin) where sd is the original sub-component for district d, and smin and smax are the minimum and maximum values, respectively, for each sub-component determined using data from both districts. Yes Table 4 shows the weight assigned to each variable derived from the first principal component. The data reduction that PCA performed on the data explained 25 per cent of the original variation of the data. The PCA factor loadings were examined, and the principal component tended to load positively on variables which contributed to lower vulnerability such as better education and better health, and negatively on variables which contributed to higher household uncerability such as higher percentage of household income from agriculture. Therefore, the score is a measure of 'strength' or preparedness. A high score		scale, it was first necessary to standardize each as an		
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selected minimum, and the range of pre- determined maximum and minimum life expectancy (UNDP, 2007): indexsd = (sd - Smin)/(Smax - Smin) where sd is the original sub-component for district d, and smin and smax are the minimum and maximum values, respectively, for each sub-component determined using data from both districts.YesTable 4 shows the weight assigned to each variable derived from the first principal component. The data reduction that PCA performed on the data. The PCA factor loadings were examined, and the principal component tended to load positively on variables which contributed to lower vulnerability such as better education and better health, and negatively on variables which contributed to higher household vulnerability such as higher percentage of household vulnerability such as higher percentage of household income from agriculture. Therefore, the score is a measure of 'strength' or preparedness. A high score		calculate the life expectancy index, which is the ratio of		
maximum and minimum life expectancy (UNDP, 2007): index_sd = (Sd - Smin)/(Smax - Smin) where sd is the original sub-component for district d, and smin and smax are the minimum and maximum values, respectively, for each sub-component determined using data from both districts.PersonYesTable 4 shows the weight assigned to each variable derived from the first principal component. The data reduction that PCA performed on the data explained 25 per cent of the original variation of the data. The PCA factor loadings were examined, and the principal component tended to load positively on variables which contributed to lower vulnerability such as better education and better health, and negatively on variables which contributed to higher household unlerability such as higher percentage of household income from agriculture. Therefore, the score is a measure of 'strength' or preparedness. A high score		the difference of the actual life expectancy and a pre-		
index_sd = (sd - Smin)/(Smax - Smin) where sd is the original sub-component for district d, and smin and smax are the minimum and maximum values, respectively, for each sub-component determined using data from both districts. Yes Table 4 shows the weight assigned to each variable derived from the first principal component. The data reduction that PCA performed on the data explained 25 per cent of the original variation of the data. The PCA factor loadings were examined, and the principal component tended to load positively on variables which contributed to lower vulnerability such as better education and better health, and negatively on variables which contributed to higher household unerability such as higher percentage of household income from agriculture. Therefore, the score is a measure of 'strength' or preparedness. A high score		selected minimum, and the range of pre- determined		
where sd is the original sub-component for district d, and smin and smax are the minimum and maximum values, respectively, for each sub-component determined using data from both districts.Second Second S		maximum and minimum life expectancy (UNDP, 2007):		
smin and smax are the minimum and maximum values, respectively, for each sub-component determined using data from both districts.YesTable 4 shows the weight assigned to each variable derived from the first principal component. The data reduction that PCA performed on the data. The PCA factor loadings were examined, and the principal component tended to load positively on variables which contributed to lower vulnerability such as better education and better health, and negatively on variables which contributed to higher household income from agriculture. Therefore, the score is a measure of 'strength' or preparedness. A high score		$index_{sd} = (S_d - S_{min})/(S_{max} - S_{min})$		
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data from both districts.YesTable 4 shows the weight assigned to each variable derived from the first principal component. The data reduction that PCA performed on the data explained 25 per cent of the original variation of the data. The PCA factor loadings were examined, and the principal component tended to load positively on variables which contributed to lower vulnerability such as better education and better health, and negatively on variables which contributed to higher household vulnerability such as higher percentage of household income from agriculture. Therefore, the score is a measure of 'strength' or preparedness. A high score		smin and smax are the minimum and maximum values,		
Yes Table 4 shows the weight assigned to each variable derived from the first principal component. The data reduction that PCA performed on the data explained 25 per cent of the original variation of the data. The PCA factor loadings were examined, and the principal component tended to load positively on variables which contributed to lower vulnerability such as better education and better health, and negatively on variables which contributed to higher household vulnerability such as higher percentage of household income from agriculture. Therefore, the score is a measure of 'strength' or preparedness. A high score		respectively, for each sub-component determined using		
derived from the first principal component. The data reduction that PCA performed on the data explained 25 per cent of the original variation of the data. The PCA factor loadings were examined, and the principal component tended to load positively on variables which contributed to lower vulnerability such as better education and better health, and negatively on variables which contributed to higher household vulnerability such as higher percentage of household income from agriculture. Therefore, the score is a measure of 'strength' or preparedness. A high score		data from both districts.		
component. The data reduction that PCA performed on the data explained 25 per cent of the original variation of the data. The PCA factor loadings were examined, and the principal component tended to load positively on variables which contributed to lower vulnerability such as better education and better health, and negatively on variables which contributed to higher household vulnerability such as higher percentage of household income from agriculture. Therefore, the score is a measure of 'strength' or preparedness. A high score	Yes	Table 4 shows the weight assigned to each variable		
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principal component tended to load positively on variables which contributed to lower vulnerability such as better education and better health, and negatively on variables which contributed to higher household vulnerability such as higher percentage of household income from agriculture. Therefore, the score is a measure of 'strength' or preparedness. A high score		the data explained 25 per cent of the original variation of		
positively on variables which contributed to lower vulnerability such as better education and better health, and negatively on variables which contributed to higher household vulnerability such as higher percentage of household income from agriculture. Therefore, the score is a measure of 'strength' or preparedness. A high score		the data. The PCA factor loadings were examined, and the		
vulnerability such as better education and better health, and negatively on variables which contributed to higher household vulnerability such as higher percentage of household income from agriculture. Therefore, the score is a measure of 'strength' or preparedness. A high score		principal component tended to load		
and negatively on variables which contributed to higher household vulnerability such as higher percentage of household income from agriculture. Therefore, the score is a measure of 'strength' or preparedness. A high score		positively on variables which contributed to lower		
household vulnerability such as higher percentage of household income from agriculture. Therefore, the score is a measure of 'strength' or preparedness. A high score		vulnerability such as better education and better health,		
household income from agriculture. Therefore, the score is a measure of 'strength' or preparedness. A high score		and negatively on variables which contributed to higher		
is a measure of 'strength' or preparedness. A high score		household vulnerability such as higher percentage of		
		household income from agriculture. Therefore, the score		
indicates a non-vulnerable household, and a low score		is a measure of 'strength' or preparedness. A high score		
		indicates a non-vulnerable household, and a low score		
indicates a vulnerable household.		indicates a vulnerable household.		

Structured summary of operationalization – validity assessment						
Construct: maximum temperature						
Article: Hahn et al (2009)						
Criterion	<u>Assessment</u>	Quoted text or Rationale for negative assessment				

Structured summary	of operationaliz	ation – validity asse	ssment		1.1 DCM	1.2 valid	1.	2. Feasible?
Construct: maximum	temperature				Appropriate	empirical rep?	conclusion -	
Article: Hahn et al (20	09)						Valid?	
<u>Criterion</u>	<u>Assessment</u>	Quoted text or Rati	onale for negative a	<u>issessment</u>				
Construct defined?	Yes	temperature by mo	dard deviation of the average daily maximum perature by month between 1998 and 2003 was aged for each provinceb			Yes/ no/ can't tell	Yes/ no/ can't tell YES	Yes/ no/ can't tell YES
Data collection methods reported?	2ndary data	provincial data; we capital	incial data; weather station based in the provincial al					
Reporting of indicators/questions used to operationalise construct?	2ndary data	comprising the Liv	nponents and sub-c relihood Vulnerabili o districts of Mozam	ty Index (LVI)		YES		
		Sub-components	Explanation of sub-components	Survey question				
		Mean standard deviation of the daily average maximum temperature by month	Standard deviation of the average daily maximum temperature by month between 1998 and 2003 was averaged for each provinceb	1998–2003: provincial data; weather station based in the provincial capital				
Sampling strategies reported?	2ndary data							
Sampling sizes	2ndary data							

reported?				
Data analysis methods reported?	Yes	The LVI uses a balanced weighted average approach (Sullivan et al., 2002) where each sub-component contributes equally to the overall index even though each major component is comprised of a different number of sub- components. Becausewe intended to develop an assessment tool accessible to a diverse set of users in resource-poor settings, the LVI formula uses the simple approach of applying equal weights to all major components. This weighting scheme could be adjusted by future users as needed. Because each of the sub- components is measured on a different scale, it was first necessary to standardize each as an index. The equation used for this conversion was adapted from that used in the Human Development Index to calculate the life expectancy index, which is the ratio of the difference of the actual life expectancy and a pre- selected minimum, and the range of pre- determined maximum and minimum life expectancy (UNDP, 2007): index _{sd} = (S _d - S _{min})/(S _{max} - S _{min}) where sd is the original sub-component for district d, and smin and smax are the minimum and maximum values, respectively, for each sub-component determined using data from both districts.		
	Yes	Table 4 shows the weight assigned to each variable derived from the first principal component. The data reduction that PCA performed on the data explained 25 per cent of the original variation of the data. The PCA factor loadings were examined, and the principal component tended to load positively on variables which contributed to lower vulnerability such as better education and better health, and negatively on variables which contributed to higher household vulnerability such as higher percentage of household income from agriculture. Therefore, the score is a measure of 'strength' or preparedness. A high score indicates a non-vulnerable household, and a low score		

indicates a vulnerable household.				
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Structured summary	of operationaliz	zation – validity asses	ssment		1.1 DCM	1.2 valid empirical rep?	1.	2. Feasible?
Construct: natural wa	ter source				Appropriate		conclusion -	
Article: Hahn et al (20	09)						Valid?	
<u>Criterion</u>	Assessment	Quoted text or Rati	onale for negative a	<u>issessment</u>				
Construct defined?	Yes	Percentage of hous pool, or hole as the	•		Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell
Data collection methods reported?	Yes	household surveys					YES	YES
Reporting of indicators/questions used to operationalise construct?	Yes	Table 1 includes an explanation of how each sub- component was quantified, the survey question used to collect the data, the original source of the survey question, and potential sources of bias. []				YES		
		comprising the Liv	Table 1 Major components and sub-componentscomprising the Livelihood Vulnerability Index (LVI)developed for two districts of Mozambique.Sub-componentsExplanation of sub-components					
		Percent of households that utilize a natural water source	Percentage of households that report a creek, river, lake, pool, or hole as their primary water source.	Where do you collect your water from?				
Sampling strategies reported?	Yes	We pilot tested the Mabote Districts of Mozaml selected by CARE-N coastal and inland o climate change issu	bique during 2007. ⁻ Iozambique as repr communities, respe	These were esentative of ctively, and the				

		[] Based on a sample size calculation (WHO, 2005) at the 95% confidence interval, 120% precision, 50% prevalence,1 and a design effect of 2 to account for cluster sampling, 200 households in each district were surveyed.2 National 1997 census data that specified the total population in each village was used to		
		 select 20 villages in each district using the probability proportional to size method (WHO, 2005; UNICEF, 2008). [] 1 50% prevalence refers to the point prevalence of the indicators selected for the LVI. This is the default value for sample size calculations when the prevalence of the indicators is unknown. 2 Sample size formula: N = DEFF*[(Z2*p*q)/e2], where N = sample size, DEFF = 2; Z = 1.96 (95% Cl), p = 0.5; q = 0.5; 		
Sampling sizes reported?	Yes	e = 0.10. We pilot tested the LVI and LVI–IPCC in the Moma and Mabote Districts [] 200 households in each district were surveyed.2 National 1997 census data that specified the total population in each village was used to select 20 villages in each district		
Data analysis methods reported?	Yes	The LVI uses a balanced weighted average approach (Sullivan et al., 2002) where each sub-component contributes equally to the overall index even though each major component is comprised of a different number of sub- components. Becausewe intended to develop an assessment tool accessible to a diverse set of users in resource-poor settings, the LVI formula uses the simple approach of applying equal weights to all major components. This weighting scheme could be adjusted by future users as needed. Because each of the sub- components is measured on a different scale, it was first necessary to standardize each as an		

r					
		index. The equation used for this conversion was adapted			
		from that used in the Human Development Index to			
		calculate the life expectancy index, which is the ratio of			
		the difference of the actual life expectancy and a pre-			
		selected minimum, and the range of pre- determined			
		maximum and minimum life expectancy (UNDP, 2007):			
		$index_{sd} = (S_d - S_{min})/(S_{max} - S_{min})$			
		where sd is the original sub-component for district d, and			
		smin and smax are the minimum and maximum values,			
		respectively, for each sub-component determined using			
		data from both districts.			
	Yes	Table 4 shows the weight assigned to each variable			
		derived from the first principal			
		component. The data reduction that PCA performed on			
		the data explained 25 per cent of the original variation of			
		the data. The PCA factor loadings were examined, and the			
		principal component tended to load			
		positively on variables which contributed to lower			
		vulnerability such as better education and better health,			
		and negatively on variables which contributed to higher			
		household vulnerability such as higher percentage of			
		household income from agriculture. Therefore, the score			
		is a measure of 'strength' or preparedness. A high score			
		indicates a non-vulnerable household, and a low score			
		indicates a vulnerable household.			
	1			1	1

Structured summary	structured summary of operationalization – validity assessment		1.1 DCM	1.2 valid	1.	2. Feasible?	
Construct: no warning of disaster		Appropriate	empirical	conclusion -			
Article: Hahn et al (2009)			rep?	Valid?			
<u>Criterion</u>	<u>Assessment</u>	Quoted text or Rationale for negative assessment					
Construct defined?	Yes	Percentage of households that did not receive a warning about the most severe flood, drought, and cyclone event in the past 6 years.	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell YES	Yes/ no/ can't tell YES	
Data collection methods reported?	Yes	household surveys	YES				

Reporting of indicators/questions used to operationalise construct?	Yes	component was collect the data, question, and po [] Table 1 Major comprising the	quantified, the s the original sources of the original sources of components and Livelihood Vulne two districts of N <i>Explanation</i> of sub-	sub-components erability Index (LVI)	YES	
		Percent of households that did not receive a warning about the pending natural disasters	components Percentage of households that did not receive a warning about the most severe flood, drought, and cyclone event in the	Did you receive a warning about the flood/cyclone/drought before it happened?		
Sampling strategies reported?	Yes	Mabote Districts of Moza selected by CAR coastal and inlar climate change i [] Based on a samp 95% confidence prevalence,1 an cluster sampling district were sur	ambique during 2 E-Mozambique a nd communities, ssues con- front ole size calculatio interval, 1210% p d a design effect 5, 200 household veyed.2 Nationa	on (WHO, 2005) at the recision, 50% of 2 to account for		

		 select 20 villages in each district using the probability proportional to size method (WHO, 2005; UNICEF, 2008). [] 1 50% prevalence refers to the point prevalence of the indicators selected for the LVI. This is the default value for sample size calculations when the prevalence of the indicators is unknown. 2 Sample size formula: N = DEFF*[(Z2*p*q)/e2], where N = sample size, DEFF = 2; Z = 1.96 (95% Cl), p = 0.5; q = 0.5; e = 0.10. 		
Sampling sizes reported?	Yes	We pilot tested the LVI and LVI–IPCC in the Moma and Mabote Districts [] 200 households in each district were surveyed.2 National 1997 census data that specified the total population in each village was used to select 20 villages in each district		
Data analysis methods reported?	Yes	The LVI uses a balanced weighted average approach (Sullivan et al., 2002) where each sub-component contributes equally to the overall index even though each major component is comprised of a different number of sub- components. Becausewe intended to develop an assessment tool accessible to a diverse set of users in resource-poor settings, the LVI formula uses the simple approach of applying equal weights to all major components. This weighting scheme could be adjusted by future users as needed. Because each of the sub- components is measured on a different scale, it was first necessary to standardize each as an index. The equation used for this conversion was adapted from that used in the Human Development Index to calculate the life expectancy index, which is the ratio of the difference of the actual life expectancy and a pre- selected minimum, and the range of pre- determined maximum and minimum life expectancy (UNDP, 2007): indexsd = (Sd - Smin)/(Smax - Smin)		

	where sd is the original sub-component for district d, and smin and smax are the minimum and maximum values, respectively, for each sub-component determined using data from both districts.		
Yes	Table 4 shows the weight assigned to each variable derived from the first principal component. The data reduction that PCA performed on the data explained 25 per cent of the original variation of the data. The PCA factor loadings were examined, and the principal component tended to load positively on variables which contributed to lower vulnerability such as better education and better health, and negatively on variables which contributed to higher household vulnerability such as higher percentage of household income from agriculture. Therefore, the score is a measure of 'strength' or preparedness. A high score indicates a non-vulnerable household, and a low score indicates a vulnerable household.		

Structured summary	of operationaliz	zation – validity assessment	1.1 DCM	1.2 valid	1.	2. Feasible?
Construct: precent of	female-headed	l households	Appropriate	empirical	conclusion -	
Article: Hahn et al (20	09)			rep?	Valid?	
<u>Criterion</u>	<u>Assessment</u>	Quoted text or Rationale for negative assessment				
Construct defined?	Yes	Percentage of households where the primary adult is female. If a male head is away from the home >6 months per year the female is counted as the head of the household	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell YES	Yes/ no/ can't tell YES
Data collection methods reported?	Yes	household surveys	YES		1	
Reporting of indicators/questions used to operationalise construct?	Yes	Table 1 includes an explanation of how each sub- component was quantified, the survey question used to collect the data, the original source of the survey question, and potential sources of bias. []		YES		

		Table 4 Main		
			nponents and sub-c	•
			elihood Vulnerabili	
			o districts of Mozam	
		Sub-components		Survey question
			sub-components	
		Percent of	Percentage of	Are you the
		female-headed	households	head of the
		households	where the	household?
			primary adult is	
			female. If a male	
			head is away	
			from the home	
			>6 months per	
			year the female	
			is counted as	
			the head of the	
			household.	
Sampling strategies	Yes		LVI and LVI–IPCC ir	h the Moma and
reported?		Mabote		
			bique during 2007.	
		-	Nozambique as repr	
			communities, respe	
		-	ies con- fronting ead	ch.
		[]		
		-	size calculation (WH	-
		95% confidence int		
			design effect of 2 to	
			00 households in ea	
			ed.2 National 1997	
		specified the total p		
		select 20 villages in	-	
			e method (WHO, 20	05; UNICEF, 2008).
		[]		
		1 50% prevalence r		
				he default value for
		sample size calculat		alence of the
		indicators is unknow		
		2 Sample size form	ula: N = DEFF*[(Z2*	p*q)/e2], where N

		= sample size, DEFF = 2; Z = 1.96 (95% Cl), p = 0.5; q = 0.5;		
		e = 0.10.		
Sampling sizes	Yes	We pilot tested the LVI and LVI–IPCC in the Moma and		
reported?		Mabote		
		Districts		
		[]		
		200 households in each		
		district were surveyed.2 National 1997 census data that		
		specified the total population in each village was used to		
		select 20 villages in each district		
Data analysis	Yes	The LVI uses a balanced weighted average approach		
methods reported?		(Sullivan		
		et al., 2002) where each sub-component contributes		
		equally to the overall index even though each major		
		component is comprised of a different number of sub-		
		components. Becausewe intended to develop an		
		assessment tool accessible to a diverse set of users in		
		resource-poor settings, the LVI formula uses the simple		
		approach of applying equal weights to all major		
		components. This weighting scheme could be adjusted by		
		future users as needed. Because each of the sub-		
		components is measured on a different		
		scale, it was first necessary to standardize each as an		
		index. The equation used for this conversion was adapted		
		from that used in the Human Development Index to		
		calculate the life expectancy index, which is the ratio of		
		the difference of the actual life expectancy and a pre-		
		selected minimum, and the range of pre- determined		
		maximum and minimum life expectancy (UNDP, 2007):		
		$index_{sd} = (s_d - s_{min})/(s_{max} - s_{min})$		
		where sd is the original sub-component for district d, and		
		smin and smax are the minimum and maximum values,		
		respectively, for each sub-component determined using		
		data from both districts.		
	Yes	Table 4 shows the weight assigned to each variable		
		derived from the first principal		
		component. The data reduction that PCA performed on		
		the data explained 25 per cent of the original variation of		

the data. The PCA factor loadings were examined, and the		
principal component tended to load		
positively on variables which contributed to lower		
vulnerability such as better education and better health,		
and negatively on variables which contributed to higher		
household vulnerability such as higher percentage of		
household income from agriculture. Therefore, the score		
is a measure of 'strength' or preparedness. A high score		
indicates a non-vulnerable household, and a low score		
indicates a vulnerable household.		

Structured summary	of operationaliz	zation – validity asses	sment		1.1 DCM	1.2 valid	1.	2. Feasible?
Construct: proximity t	o health facility	1			Appropriate	empirical	conclusion - Valid?	
Article: Hahn et al (20	09)					rep?		
<u>Criterion</u>	Assessment	Quoted text or Rati	uoted text or Rationale for negative assessment					
Construct defined?	Yes	Average time it take health facility.	verage time it takes the households to get to the nearest ealth facility.			Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell
Data collection methods reported?	Yes	household surveys	· · · · · · · · · · · · · · · · · · ·				YES	YES
Reporting of indicators/questions used to operationalise construct?	Yes	component was qua collect the data, the	Table 1 Major components and sub-components comprising the Livelihood Vulnerability Index (LVI) developed for two districts of Mozambique.					
		comprising the Liv						
	Sub-components Explanation of Survey quest sub-components			Survey question				
		Average time to health facility (minutes)	Average time it takes the households to get to the nearest health	Howlong does it take you to get to a health facility?				

		facility.		
Sampling strategies	Yes	We pilot tested the LVI and LVI–IPCC in the Moma and		
reported?		Mabote		
		Districts of Mozambique during 2007. These were		
		selected by CARE-Mozambique as representative of		
		coastal and inland communities, respectively, and the		
		climate change issues con- fronting each.		
		[]		
		Based on a sample size calculation (WHO, 2005) at the		
		95% confidence interval, 210% precision, 50%		
		prevalence,1 and a design effect of 2 to account for		
		cluster sampling, 200 households in each		
		district were surveyed.2 National 1997 census data that		
		specified the total population in each village was used to		
		select 20 villages in each district using the probability		
		proportional to size method (WHO, 2005; UNICEF, 2008).		
		[]		
		1 50% prevalence refers to the point prevalence of the		
		indicators selected for the LVI. This is the default value for		
		sample size calculations when the prevalence of the		
		indicators is unknown.		
		2 Sample size formula: N = DEFF*[(Z2*p*q)/e2], where N		
		= sample size, DEFF = 2; Z = 1.96 (95% CI), p = 0.5; q = 0.5;		
		e = 0.10.		
Sampling sizes	Yes	We pilot tested the LVI and LVI–IPCC in the Moma and		
reported?		Mabote		
		Districts		
		[]		
		200 households in each		
		district were surveyed.2 National 1997 census data that		
		specified the total population in each village was used to		
		select 20 villages in each district		
Data analysis	Yes	The LVI uses a balanced weighted average approach		
methods reported?		(Sullivan		
		et al., 2002) where each sub-component contributes		
		equally to the overall index even though each major		
		component is comprised of a different number of sub-		
		components. Becausewe intended to develop an		

assessment tool accessible to a diverse set of users in resource-poor settings, the LVI formula uses the simple approach of applying equal weights to all major components. This weighting scheme could be adjusted by future users as needed. Because each of the sub- components is measured on a different scale, it was first necessary to standardize each as an index. The equation used for this conversion was adapted from that used in the Human Development Index to calculate the life expectancy index, which is the ratio of the difference of the actual life expectancy and a pre- selected minimum, and the range of pre- determined maximum and minimum life expectancy (UNDP, 2007): index.a = (sa - Smin)/(Smax - Smin) where sd is the original sub-component for district d, and smin and smax are the minimum and maximum values, respectively, for each sub-component determined using data from both districts. Yes Table 4 shows the weight assigned to each variable derived from the first principal component. The data reduction that PCA performed on the data explained 25 per cent of the original variation of the data. The PCA factor loadings were examined, and the principal component. The data reducti	r				
approach of applying equal weights to all major components. This weighting scheme could be adjusted by future users as needed. Because each of the sub- components is measured on a different scale, it was first necessary to standardize each as an index. The equation used for this conversion was adapted from that used in the Human Development Index to calculate the life expectancy and a pre- selected minimum, and the range of pre- determined maximum and minimum life expectancy (UNDP, 2007): indexr = (ser = smi)(Smax = smi) where sd is the original sub-component for district d, and smin and smax are the minimum and maximum values, respectively, for each sub-component determined using data from both districts. Yes Table 4 shows the weight assigned to each variable derived from the first principal component. The data reduction that PCA performed on the data. The PCA factor loadings were examined, and the principal component tended to load positively on variables which contributed to lower vulnerability such as better education and better health, and negatively on variables which contributed to higher household uncera first or d'strength' or preparedness. A high score					
Yes Table 4 shows the weight assigned to each variable derived from the first principal component to the first principal component to load rpincipal solution of the data reduction that PCA performed on the data requestion adbeter health, and negatively on variables which contributed to load positively on variables which contributed to load positively on variables which contributed to higher thousehold vulnerability such as better reduction adbeter from the data reduction that proceedings of the original such component to head to household vulnerability such as better deviced from abbeter from the first principal is a measure of "strength" or preparedness. A high score			resource-poor settings, the LVI formula uses the simple		
YesYesYesTable 4 shows the weight assigned to each variable derived from the first pricessal used sub- component tended to load positively on variables which contributed to lower vulnerability such as higher percentage of household ullerability such as higher percentage of household hullerability such as higher percentage of household hullerability such as higher percentage of household			approach of applying equal weights to all major		
components is measured on a differentscale, it was first necessary to standardize each as anindex. The equation used for this conversion was adaptedfrom that used in the Human Development Index tocalculate the life expectancy index, which is the ratio ofthe difference of the actual life expectancy and a pre-selected minimum, and the range of pre- determinedmaximum and minimum life expectancy (UNDP, 2007):index = (sa - Smin)/(Smax - Smin)where sd is the original sub-component for district d, andsmin and smax are the minimum and maximum values,respectively, for each sub-component determined usingdata from both districts.YesTable 4 shows the weight assigned to each variablederived from the first principalcomponent. The data reduction that PCA performed onthe data explained 25 per cent of the original variation ofthe data. The PCA factor loadings were examined, and theprincipal component tended to loadpositively on variables which contributed to lowervulnerability such as better education and better health,and negatively on variables which contributed to higherhousehold ulnerability such as higher percentage ofhousehold ulnerability such as higher percentage ofhousehold ulnerability representage ofhousehold ulnerability or preparedness. A high score			components. This weighting scheme could be adjusted by		
scale, it was first necessary to standardize each as an index. The equation used for this conversion was adapted from that used in the Human Development Index to calculate the life expectancy index, which is the ratio of the difference of the actual life expectancy and a pre- selected minimum, and the range of pre- determined maximum and minimum life expectancy (UNDP, 2007): index_a = (Sa - Smm)/(Smax - Smm) where sd is the original sub-component for district d, and smin and smax are the minimum and maximum values, respectively, for each sub-component determined using data from both districts.YesTable 4 shows the weight assigned to each variable derived from the first principal component. The data reduction that PCA performed on the data. The PCA factor loadings were examined, and the principal component ended to load positively on variables which contributed to lower vulnerability such as better education and better health, and negatively on variables which contributed to higher household unceme from agriculture. Therefore, the score is a measure of 'strength' or preparedness. A high score			future users as needed. Because each of the sub-		
index. The equation used for this conversion was adapted from that used in the Human Development Index to calculate the life expectancy index, which is the ratio of the difference of the actual life expectancy and a pre- selected minimum, and the range of pre- determined maximum and minimum life expectancy (UNDP, 2007): indexd = (sd - Smin)/(Smar - Smin) where sd is the original sub-component for district d, and smin and smax are the minimum and maximum values, respectively, for each sub-component determined using data from both districts.YesTable 4 shows the weight assigned to each variable derived from bth districtsin the data. The PCA factor loadings were examined, and the principal component tended to load positively on variables which contributed to lower vulnerability such as better education and better health, and negatively on variables which contributed to higher household ulnerability such as higher percentage of household ulnerability such as higher percentage of household ulnerability such as higher percentage of household ulnerability or perperdeness. A high score			components is measured on a different		
from that used in the Human Development Index to calculate the life expectancy index, which is the ratio of the difference of the actual life expectancy and a pre- selected minimum, and the range of pre- determined maximum and minimum life expectancy (UNDP, 2007): index_d = (sa - Smin)/(Smax - Smin) where sd is the original sub-component for district d, and smin and smax are the minimum and maximum values, respectively, for each sub-component determined using data from both districts.YesTable 4 shows the weight assigned to each variable derived from the first principal component. The data reduction that PCA performed on the data explained 25 per cent of the original variation of the data. The PCA factor loadings were examined, and the principal component tended to load positively on variables which contributed to lower vulnerability such as better education and better health, and negatively on variables which contributed to higher household vulnerability such as higher percentage of household income from agriculture. Therefore, the score is a measure of 'strength' or preparedness. A high score			scale, it was first necessary to standardize each as an		
calculate the life expectancy index, which is the ratio of the difference of the actual life expectancy and a pre- selected minimum, and the range of pre- determined maximum and minimum life expectancy (UNDP, 2007): indexsd = (5d - 5min)/(5max - 5min) where sd is the original sub-component for district d, and smin and smax are the minimum and maximum values, respectively, for each sub-component determined using data from both districts.YesTable 4 shows the weight assigned to each variable derived from the first principal component. The data reduction that PCA performed on the data explained 25 per cent of the original variation of the data. The PCA factor loadings were examined, and the principal component tended to load positively on variables which contributed to lower vulnerability such as better education and better health, and negatively on variables which contributed to higher household uncerform group representage of household uncerform group representage of household income from agriculture. Therefore, the score is a measure of 'strength' or preparedness. A high score			index. The equation used for this conversion was adapted		
YesTable 4 shows the weight assigned to each variable derived from the first principal component. The data reduction that PCA performed on the data. The PCA factor loadings were examined, and the opsitively on variables which contributed to lower vulnerability such as better education and better health, and negatively on variables which contributed to ligher household vulnerability such as higher percentage of household vulnerability such as high score			from that used in the Human Development Index to		
selected minimum, and the range of pre- determined maximum and minimum life expectancy (UNDP, 2007): indexul = (Su - Smin)/(Smax - Smin) where sd is the original sub-component for district d, and smin and smax are the minimum and maximum values, respectively, for each sub-component determined using data from both districts.Image: Selected minimum and maximum values, respectively, for each sub-component determined using data from both districts.YesTable 4 shows the weight assigned to each variable derived from the first principal component. The data reduction that PCA performed on the data explained 25 per cent of the original variation of the data. The PCA factor loadings were examined, and the principal component tended to load positively on variables which contributed to lower vulnerability such as better education and better health, and negatively on variables which contributed to higher household ulnerability such as higher percentage of household income from agriculture. Therefore, the score is a measure of 'strength' or preparedness. A high score			calculate the life expectancy index, which is the ratio of		
maximum and minimum life expectancy (UNDP, 2007): indexsd = (Sd - Smin)/(Smax - Smin) where sd is the original sub-component for district d, and smin and smax are the minimum and maximum values, respectively, for each sub-component determined using data from both districts.YesTable 4 shows the weight assigned to each variable derived from the first principal component. The data reduction that PCA performed on the data. The PCA factor loadings were examined, and the principal component tended to load positively on variables which contributed to lower vulnerability such as better education and better health, and negatively on variables which contributed to higher household income from agriculture. Therefore, the score is a measure of 'strength' or preparedness. A high score			the difference of the actual life expectancy and a pre-		
indexsd = (Sd - Smin)/(Smax - Smin) where sd is the original sub-component for district d, and smin and smax are the minimum and maximum values, respectively, for each sub-component determined using data from both districts. Yes Table 4 shows the weight assigned to each variable derived from the first principal component. The data reduction that PCA performed on the data explained 25 per cent of the original variation of the data. The PCA factor loadings were examined, and the principal component tended to load positively on variables which contributed to lower vulnerability such as better education and better health, and negatively on variables which contributed to higher household uncerability such as higher percentage of household income from agriculture. Therefore, the score is a measure of 'strength' or preparedness. A high score			selected minimum, and the range of pre- determined		
where sd is the original sub-component for district d, and smin and smax are the minimum and maximum values, respectively, for each sub-component determined using data from both districts.YesTable 4 shows the weight assigned to each variable derived from the first principal component. The data reduction that PCA performed on the data explained 25 per cent of the original variation of the data. The PCA factor loadings were examined, and the principal component tended to load positively on variables which contributed to lower vulnerability such as better education and better health, and negatively on variables which contributed to higher household income from agriculture. Therefore, the score is a measure of 'strength' or preparedness. A high score			maximum and minimum life expectancy (UNDP, 2007):		
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respectively, for each sub-component determined using data from both districts.Image: Component determined using data from both districts.YesTable 4 shows the weight assigned to each variable derived from the first principal component. The data reduction that PCA performed on the data explained 25 per cent of the original variation of the data. The PCA factor loadings were examined, and the principal component tended to load positively on variables which contributed to lower vulnerability such as better education and better health, and negatively on variables which contributed to higher household vulnerability such as higher percentage of household income from agriculture. Therefore, the score is a measure of 'strength' or preparedness. A high scoreImage: Component tended to load positively on variables which contributed to higher household income from agriculture. Therefore, the score is a measure of 'strength' or preparedness. A high scoreImage: Component tended to load positively on variables. A high score			where sd is the original sub-component for district d, and		
data from both districts.YesTable 4 shows the weight assigned to each variable derived from the first principal component. The data reduction that PCA performed on the data explained 25 per cent of the original variation of the data. The PCA factor loadings were examined, and the principal component tended to load positively on variables which contributed to lower vulnerability such as better education and better health, and negatively on variables which contributed to higher household vulnerability such as higher percentage of household income from agriculture. Therefore, the score is a measure of 'strength' or preparedness. A high score			smin and smax are the minimum and maximum values,		
data from both districts.YesTable 4 shows the weight assigned to each variable derived from the first principal component. The data reduction that PCA performed on the data explained 25 per cent of the original variation of the data. The PCA factor loadings were examined, and the principal component tended to load positively on variables which contributed to lower vulnerability such as better education and better health, and negatively on variables which contributed to higher household vulnerability such as higher percentage of household income from agriculture. Therefore, the score is a measure of 'strength' or preparedness. A high score			respectively, for each sub-component determined using		
derived from the first principal component. The data reduction that PCA performed on the data explained 25 per cent of the original variation of the data. The PCA factor loadings were examined, and the principal component tended to load positively on variables which contributed to lower vulnerability such as better education and better health, and negatively on variables which contributed to higher household vulnerability such as higher percentage of household income from agriculture. Therefore, the score is a measure of 'strength' or preparedness. A high scoreImage: Component is a measure of the score is a measure of 'strength' or preparedness. A high score					
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the data explained 25 per cent of the original variation of the data. The PCA factor loadings were examined, and the principal component tended to load positively on variables which contributed to lower vulnerability such as better education and better health, and negatively on variables which contributed to higher household vulnerability such as higher percentage of household income from agriculture. Therefore, the score is a measure of 'strength' or preparedness. A high score			derived from the first principal		
the data explained 25 per cent of the original variation of the data. The PCA factor loadings were examined, and the principal component tended to load positively on variables which contributed to lower vulnerability such as better education and better health, and negatively on variables which contributed to higher household vulnerability such as higher percentage of household income from agriculture. Therefore, the score is a measure of 'strength' or preparedness. A high score			component. The data reduction that PCA performed on		
principal component tended to load positively on variables which contributed to lower vulnerability such as better education and better health, and negatively on variables which contributed to higher household vulnerability such as higher percentage of household income from agriculture. Therefore, the score is a measure of 'strength' or preparedness. A high score			the data explained 25 per cent of the original variation of		
positively on variables which contributed to lower vulnerability such as better education and better health, and negatively on variables which contributed to higher household vulnerability such as higher percentage of household income from agriculture. Therefore, the score is a measure of 'strength' or preparedness. A high score			the data. The PCA factor loadings were examined, and the		
vulnerability such as better education and better health, and negatively on variables which contributed to higher household vulnerability such as higher percentage of household income from agriculture. Therefore, the score is a measure of 'strength' or preparedness. A high score			principal component tended to load		
and negatively on variables which contributed to higher household vulnerability such as higher percentage of household income from agriculture. Therefore, the score is a measure of 'strength' or preparedness. A high score			positively on variables which contributed to lower		
household vulnerability such as higher percentage of household income from agriculture. Therefore, the score is a measure of 'strength' or preparedness. A high score					
household vulnerability such as higher percentage of household income from agriculture. Therefore, the score is a measure of 'strength' or preparedness. A high score			and negatively on variables which contributed to higher		
household income from agriculture. Therefore, the score is a measure of 'strength' or preparedness. A high score					
is a measure of 'strength' or preparedness. A high score					
			-		
indicates a vulnerable household.					

Structured summary of operationalization – validity assessment	1.1 DCM	1.2 valid	1.	2. Feasible?
Construct: proximity to water source	Appropriate	empirical	conclusion -	

Article: Hahn et al (20	09)					rep?	Valid?			
<u>Criterion</u>	Assessment	Quoted text or Rati	onale for negative a	<u>issessment</u>						
Construct defined?	Yes	Average time it tak	es the households to	o travel to their	Yes/ no/ can't	Yes/ no/	Yes/ no/	Yes/ no/		
		primary water sour	ce.		tell	can't tell	can't tell can't te			
Data collection methods reported?	Yes	household surveys YES YES						YES		
Reporting of indicators/questions used to operationalise construct?	Yes	component was qu collect the data, the question, and poter [] Table 1 Major con comprising the Liv	explanation of how antified, the survey e original source of t ntial sources of bias nponents and sub-co velihood Vulnerabilit o districts of Mozam <i>Explanation of</i> <i>sub-components</i> Average time it takes the households to travel to their primary water	question used to the survey omponents ty Index (LVI)		YES				
Sampling strategies reported?	Yes	We pilot tested the Mabote	source.	the Moma and						
		selected by CARE-N coastal and inland of climate change issue [] Based on a sample 95% confidence int prevalence,1 and a cluster sampling, 20 district were survey specified the total p select 20 villages in	bique during 2007. 1 Aozambique as representations, respective es con- fronting each size calculation (WH erval, 1210% precision design effect of 2 to 20 households in each yed.2 National 1997 population in each v each district using to e method (WHO, 200	esentative of ctively, and the ch. 40, 2005) at the on, 50% o account for ch census data that iillage was used to the probability						

		 [] 1 50% prevalence refers to the point prevalence of the indicators selected for the LVI. This is the default value for sample size calculations when the prevalence of the indicators is unknown. 2 Sample size formula: N = DEFF*[(Z2*p*q)/e2], where N = sample size, DEFF = 2; Z = 1.96 (95% CI), p = 0.5; q = 0.5; e = 0.10. 	
Sampling sizes reported?	Yes	We pilot tested the LVI and LVI–IPCC in the Moma and Mabote Districts [] 200 households in each district were surveyed.2 National 1997 census data that specified the total population in each village was used to select 20 villages in each district	
Data analysis methods reported?	Yes	The LVI uses a balanced weighted average approach (Sullivan et al., 2002) where each sub-component contributes equally to the overall index even though each major component is comprised of a different number of sub- components. Becausewe intended to develop an assessment tool accessible to a diverse set of users in resource-poor settings, the LVI formula uses the simple approach of applying equal weights to all major components. This weighting scheme could be adjusted by future users as needed. Because each of the sub- components is measured on a different scale, it was first necessary to standardize each as an index. The equation used for this conversion was adapted from that used in the Human Development Index to calculate the life expectancy index, which is the ratio of the difference of the actual life expectancy and a pre- selected minimum, and the range of pre- determined maximum and minimum life expectancy (UNDP, 2007): index _{sd} = (S _d - S _{min})/(S _{max} - S _{min}) where sd is the original sub-component for district d, and smin and smax are the minimum and maximum values,	

	respectively, for each sub-component determined using data from both districts.		
Yes	Table 4 shows the weight assigned to each variable derived from the first principal component. The data reduction that PCA performed on the data explained 25 per cent of the original variation of the data. The PCA factor loadings were examined, and the principal component tended to load positively on variables which contributed to lower vulnerability such as better education and better health, and negatively on variables which contributed to higher household vulnerability such as higher percentage of household income from agriculture. Therefore, the score is a measure of 'strength' or preparedness. A high score indicates a vulnerable household.		

Structured summary	tructured summary of operationalization – validity assessment			1.2 valid	1.	2. Feasible?
Construct: receive-giv	e ratio		Appropriate	empirical rep?	conclusion - Valid?	
Article: Hahn et al (20	09)					
<u>Criterion</u>	Assessment	Quoted text or Rationale for negative assessment				
Construct defined?	Yes	Ratio of (the number of types of help received by a household in the past month + 1) to (the number of type of help given by a household to someone else in the past month + 1).		Yes/ no/ can't tell	Yes/ no/ can't tell YES	Yes/ no/ can't tell YES
Data collection methods reported?	Yes	household surveys	YES			
Reporting of indicators/questions used to operationalise construct?	Yes	Table 1 includes an explanation of how each sub- component was quantified, the survey question used to collect the data, the original source of the survey question, and potential sources of bias. []		YES		
		Table 1 Major components and sub-componentscomprising the Livelihood Vulnerability Index (LVI)developed for two districts of Mozambique.Sub-componentsExplanation ofSurvey question				

	1			1			r 1
			sub-components				
		Average	Ratio of (the	In the past			
		Receive:Give	number of types	month, did			
		ratio (range: 0–	of help received	relatives or			
		15)	by a household	friends help you			
			in the past	and your family:			
			month + 1) to	(e.g. <i>,</i> Get			
			(the number of	medical care or			
			types of help	medicines, Sell			
			given by a	animal products			
			household to	or other goods			
			someone else in	produced by			
			the past month	family, Take			
			+ 1).	care of children)			
			· -,.	In the past			
				month, did you			
				and your family			
				help relatives or			
				friends: (same			
				choices as			
				above)			
Sampling strategies	Yes	We nilot tested the	L LVI and LVI–IPCC ir				
reported?	165	Mabote					
reporteu:			bique during 2007. ⁻	Thosoworo			
			Aozambique as repr				
		-	communities, respe				
			-				
		[]	ies con- fronting ead				
			size calculation (WH	10 200E) at the			
			•				
			erval, 210% precisio				
		-	design effect of 2 to				
		cluster sampling, 200 households in each					
		district were surveyed.2 National 1997 census data that specified the total population in each village was used to					
			•	-			
			each district using				
			e method (WHO, 20	US; UNICEF, 2008).			
		[]	afana ka kha na 'at a	way walawaa af the			
		1 50% prevalence r	efers to the point p	revalence of the			

Sampling sizes reported?	Yes	 indicators selected for the LVI. This is the default value for sample size calculations when the prevalence of the indicators is unknown. 2 Sample size formula: N = DEFF*[(Z2*p*q)/e2], where N = sample size, DEFF = 2; Z = 1.96 (95% CI), p = 0.5; q = 0.5; e = 0.10. We pilot tested the LVI and LVI–IPCC in the Moma and Mabote Districts [] 200 households in each 	
		district were surveyed.2 National 1997 census data that specified the total population in each village was used to select 20 villages in each district	
Data analysis methods reported?	Yes	The LVI uses a balanced weighted average approach (Sullivan et al., 2002) where each sub-component contributes equally to the overall index even though each major component is comprised of a different number of sub- components. Becausewe intended to develop an assessment tool accessible to a diverse set of users in resource-poor settings, the LVI formula uses the simple approach of applying equal weights to all major components. This weighting scheme could be adjusted by future users as needed. Because each of the sub- components is measured on a different scale, it was first necessary to standardize each as an index. The equation used for this conversion was adapted from that used in the Human Development Index to calculate the life expectancy index, which is the ratio of the difference of the actual life expectancy and a pre- selected minimum, and the range of pre- determined maximum and minimum life expectancy (UNDP, 2007): index _{sd} = (s _d - s _{min})/(s _{max} - s _{min}) where sd is the original sub-component for district d, and smin and smax are the minimum and maximum values, respectively, for each sub-component determined using data from both districts.	

Yes	es	Table 4 shows the weight assigned to each variable		
		derived from the first principal		
		component. The data reduction that PCA performed on		
		the data explained 25 per cent of the original variation of		
		the data. The PCA factor loadings were examined, and the		
		principal component tended to load		
		positively on variables which contributed to lower		
		vulnerability such as better education and better health,		
		and negatively on variables which contributed to higher		
		household vulnerability such as higher percentage of		
		household income from agriculture. Therefore, the score		
		is a measure of 'strength' or preparedness. A high score		
		indicates a non-vulnerable household, and a low score		
		indicates a vulnerable household.		

Structured summary	of operationaliz	ation – validity asse	essment		1.1 DCM	1.2 valid empirical rep?	1. conclusion - Valid?	2. Feasible?
Construct: struggle for	r food				Appropriate			
Article: Hahn et al (20	09)							
<u>Criterion</u>	Assessment	Quoted text or Rat	tionale for negative	assessment				
Construct defined?	Yes	Average number o food for their fami		ds struggle to obtain	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell
Data collection methods reported?	Yes	household surveys	ousehold surveys YES				YESS	YES
Reporting of indicators/questions used to operationalise construct?	Yes	component was que collect the data, the	Table 1 includes an explanation of how each sub- component was quantified, the survey question used to collect the data, the original source of the survey question, and potential sources of bias.[]			YES		
		comprising the Li	mponents and sub- velihood Vulnerabi o districts of Moza <i>Explanation of</i> <i>sub-</i>	lity Index (LVI)				
			components					

		Average number of months households struggle to find food (range: 0–	Average number of months households struggle to obtain food for	Does your family have adequate food the whole year, or are there times during the year that your		
		12)	their family.	family does not have enough food? Howmanymonths a year does your family have trouble getting		
				enough food?		
Sampling strategies reported?	Yes	Mabote Districts of Mozam selected by CARE-I coastal and inland climate change issi [] Based on a sample 95% confidence in prevalence,1 and a cluster sampling, 2 district were surve specified the total select 20 villages in proportional to siz [] 1 50% prevalence indicators selected sample size calcula indicators is unkno 2 Sample size form = sample size, DEF	population in each e each district using e method (WHO, 2 refers to the point l for the LVI. This is ations when the pre own. nula: N = DEFF*[(Z2	These were presentative of ectively, and the ach. (HO, 2005) at the ion, 50% to account for ach 7 census data that village was used to g the probability 2005; UNICEF, 2008). prevalence of the the default value for		
Sampling sizes	Yes	e = 0.10. We pilot tested the	e LVI and LVI–IPCC	in the Moma and		
Sampling sizes	162	we phot tested the				

reported?		Mabote			
		Districts			
		[]			
		200 households in each			
		district were surveyed.2 National 1997 census data that			
		specified the total population in each village was used to			
		select 20 villages in each district			
Data analysis	Yes	The LVI uses a balanced weighted average approach			
	res	(Sullivan			
methods reported?		•			
		et al., 2002) where each sub-component contributes			
		equally to the overall index even though each major			
		component is comprised of a different number of sub-			
		components. Becausewe intended to develop an			
		assessment tool accessible to a diverse set of users in			
		resource-poor settings, the LVI formula uses the simple			
		approach of applying equal weights to all major			
		components. This weighting scheme could be adjusted by			
		future users as needed. Because each of the sub-			
		components is measured on a different			
		scale, it was first necessary to standardize each as an			
		index. The equation used for this conversion was adapted			
		from that used in the Human Development Index to			
		calculate the life expectancy index, which is the ratio of			
		the difference of the actual life expectancy and a pre-			
		selected minimum, and the range of pre- determined			
		maximum and minimum life expectancy (UNDP, 2007):			
		$index_{sd} = (s_d - s_{min})/(s_{max} - s_{min})$			
		where sd is the original sub-component for district d, and			
		smin and smax are the minimum and maximum values,			
		respectively, for each sub-component determined using			
		data from both districts.			
	Yes	Table 4 shows the weight assigned to each variable			
		derived from the first principal			
		component. The data reduction that PCA performed on			
		the data explained 25 per cent of the original variation of			
		the data. The PCA factor loadings were examined, and the			
		principal component tended to load			
		positively on variables which contributed to lower			
	1	positively on variables which contributed to lower		l	l

vulnerability such as better education and better health,		
and negatively on variables which contributed to higher		
household vulnerability such as higher percentage of		
household income from agriculture. Therefore, the score		
is a measure of 'strength' or preparedness. A high score		
indicates a non-vulnerable household, and a low score		
indicates a vulnerable household.		

Structured summary	of operationaliz	ation – validity asses	ssment		1.1 DCM	1.2 valid	1.	2. Feasible?
Construct: uneducate	d headed house	eholds			Appropriate	empirical	conclusion -	
Article: Hahn et al (20	09)					rep?	Valid?	
<u>Criterion</u>	Assessment	Quoted text or Rati	onale for negative a	<u>issessment</u>				
Construct defined?	Yes	-	rcentage of households where the head of the usehold reports that they have attended 0 years of nool			Yes/ no/ can't tell	Yes/ no/ can't tell NO	Yes/ no/ can't tell YES
Data collection methods reported?	Yes	household surveys			YES			
Reporting of indicators/questions used to operationalise construct?	Yes	comprising the Liv	antified, the survey e original source of t	question used to the survey omponents ty Index (LVI)		NO		

		attended 0
		years of school.
Sampling strategies reported?	Yes	We pilot tested the LVI and LVI-IPCC in the Moma and Mabote Districts of Mozambique during 2007. These were selected by CARE-Mozambique as representative of coastal and inland communities, respectively, and the climate change issues con- fronting each. [] Based on a sample size calculation (WHO, 2005) at the 95% confidence interval, ⊠10% precision, 50% prevalence,1 and a design effect of 2 to account for cluster sampling, 200 households in each district were surveyed. 2 National 1997 census data that specified the total population in each village was used to select 20 villages in each district using the probability proportional to size method (WHO, 2005; UNICEF, 2008). [] 1 50% prevalence refers to the point prevalence of the indicators selected for the LVI. This is the default value for sample size calculations when the prevalence of the indicators is unknown. 2 Sample size formula: N = DEFF*[[(Z2*p*q)/e2], where N = sample size, DEFF = 2; Z = 1.96 (95% CI), p = 0.5; q = 0.5; e = 0.10.
Sampling sizes reported?	Yes	We pilot tested the LVI and LVI–IPCC in the Moma and Mabote Districts [] 200 households in each district were surveyed.2 National 1997 census data that specified the total population in each village was used to select 20 villages in each district
Data analysis methods reported?	Yes	The LVI uses a balanced weighted average approach (Sullivan et al., 2002) where each sub-component contributes equally to the overall index even though each major component is comprised of a different number of sub-

 1			
	components. Becausewe intended to develop an		
	assessment tool accessible to a diverse set of users in		
	resource-poor settings, the LVI formula uses the simple		
	approach of applying equal weights to all major		
	components. This weighting scheme could be adjusted by		
	future users as needed. Because each of the sub-		
	components is measured on a different		
	scale, it was first necessary to standardize each as an		
	index. The equation used for this conversion was adapted		
	from that used in the Human Development Index to		
	calculate the life expectancy index, which is the ratio of		
	the difference of the actual life expectancy and a pre-		
	selected minimum, and the range of pre- determined		
	maximum and minimum life expectancy (UNDP, 2007):		
	$index_{sd} = (s_d - s_{min})/(s_{max} - s_{min})$		
	where sd is the original sub-component for district d, and		
	smin and smax are the minimum and maximum values,		
	respectively, for each sub-component determined using		
	data from both districts.		
Yes	Table 4 shows the weight assigned to each variable		
	derived from the first principal		
	component. The data reduction that PCA performed on		
	the data explained 25 per cent of the original variation of		
	the data. The PCA factor loadings were examined, and the		
	principal component tended to load		
	positively on variables which contributed to lower		
	vulnerability such as better education and better health,		
	and negatively on variables which contributed to higher		
	household vulnerability such as higher percentage of		
	household income from agriculture. Therefore, the score		
	is a measure of 'strength' or preparedness. A high score		
	indicates a non-vulnerable household, and a low score		
	indicates a vulnerable household.		
1			

Structured summary of operationalization – validity assessment	1.1 DCM	1.2 valid	1.	2. Feasible?
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Construct: water conflict Article: Hahn et al (2009)					Appropriate	empirical rep?	conclusion -	
							Valid?	
<u>Criterion</u>	<u>Assessment</u>	Quoted text or Rati	onale for negative a					
Construct defined?	Yes	Percentage of households that report having heard about			Yes/ no/ can't	Yes/ no/	Yes/ no/ can't tell	Yes/ no/ can't tell
		conflicts over water in their community			tell	can't tell		
Data collection	Yes	household surveys			YES		YES	YES
methods reported?		Table 1 includes an explanation of how each sub-				VEC	_	
Reporting of	Yes	component was quantified, the survey question used to				YES		
indicators/questions used to		collect the data, the original source of the survey						
operationalise		question, and potential sources of bias.						
construct?		[]						
		[]						
		Table 1 Major components and sub-components comprising the Livelihood Vulnerability Index (LVI)						
		developed for two districts of Mozambique.						
		Sub-components	Explanation of	Survey question				
			sub-components					
		Percent of	Percentage of	In the past year,				
		households	households that	have you heard				
		reporting water	report having	about any				
		conflicts	heard about	conflicts over				
			conflicts over	water in your				
			water in their	community?				
Sampling strategies	Yes	We pilot tested the	community.	the Mome and				
reported?	Tes	We pilot tested the LVI and LVI–IPCC in the Moma and Mabote Districts of Mozambique during 2007. These were						
		selected by CARE-Mozambique as representative of						
		coastal and inland communities, respectively, and the climate change issues con- fronting each.						
		[]						
		Based on a sample size calculation (WHO, 2005) at the						
		95% confidence interval, 🛛 10% precision, 50%						
		prevalence,1 and a design effect of 2 to account for						
		cluster sampling, 200 households in each district were surveyed.2 National 1997 census data that specified the total population in each village was used to						

		 select 20 villages in each district using the probability proportional to size method (WHO, 2005; UNICEF, 2008). [] 1 50% prevalence refers to the point prevalence of the indicators selected for the LVI. This is the default value for sample size calculations when the prevalence of the indicators is unknown. 2 Sample size formula: N = DEFF*[(Z2*p*q)/e2], where N = sample size, DEFF = 2; Z = 1.96 (95% CI), p = 0.5; q = 0.5; e = 0.10. 		
Sampling sizes reported?	Yes	We pilot tested the LVI and LVI–IPCC in the Moma and Mabote Districts [] 200 households in each district were surveyed.2 National 1997 census data that specified the total population in each village was used to select 20 villages in each district		
Data analysis methods reported?	Yes	The LVI uses a balanced weighted average approach (Sullivan et al., 2002) where each sub-component contributes equally to the overall index even though each major component is comprised of a different number of sub- components. Becausewe intended to develop an assessment tool accessible to a diverse set of users in resource-poor settings, the LVI formula uses the simple approach of applying equal weights to all major components. This weighting scheme could be adjusted by future users as needed. Because each of the sub- components is measured on a different scale, it was first necessary to standardize each as an index. The equation used for this conversion was adapted from that used in the Human Development Index to calculate the life expectancy index, which is the ratio of the difference of the actual life expectancy and a pre- selected minimum, and the range of pre- determined maximum and minimum life expectancy (UNDP, 2007): indexsd = (sd - Smin)/(Smax - Smin)		

			1
	where sd is the original sub-component for district d, and		
	smin and smax are the minimum and maximum values,		
	respectively, for each sub-component determined using		
	data from both districts.		
Yes	Table 4 shows the weight assigned to each variable		
	derived from the first principal		
	component. The data reduction that PCA performed on		
	the data explained 25 per cent of the original variation of		
	the data. The PCA factor loadings were examined, and the		
	principal component tended to load		
	positively on variables which contributed to lower		
	vulnerability such as better education and better health,		
	and negatively on variables which contributed to higher		
	household vulnerability such as higher percentage of		
	household income from agriculture. Therefore, the score		
	is a measure of 'strength' or preparedness. A high score		
	indicates a non-vulnerable household, and a low score		
	indicates a vulnerable household.		

Article	lonesco et al (2009)
Transparent operationalizations	Adaptive capacity as set (ATEAM); entity (ATEAM); preference criteria (ATEAM); reference scenarios (ATEAM); stimulus (ATEAM); adaptive capacity as set (DINAS); entity (DINAS); preference criteria (DINAS); reference scenario (DINAS); stimulus (DINAS).
Partially transparent	
Not transparent	

Structured summary	of operationaliz	ation – validity assessment	1.1 DCM	1.2 valid	1.	2. Feasible?
Construct: adaptive c	apacity as set		Appropriate	empirical	conclusion -	
Article: Ionesco et al	(2009)			rep?	Valid?	
<u>Criterion</u>	Assessment	Quoted text or Rationale for negative assessment				
Construct defined?	Yes	Definition (Adaptive capacity as a set) The adaptive capacity of a system f in state x subjected to an input e is represented by the set of its effective actions.	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell CAN'T TELL	Yes/ no/ can't tell CAN'T TELL
Data collection methods reported?	ATEAM: 2ndary data	The objective of this section is to relate the framework developed in Section 3 to the IPCCconceptualisation of vulnerability (see Fig. 1) and to two recent vulnerability assessments:Advanced Terrestrial EcosystemAnalysis and Modelling (ATEAM) and Dynamic and Inter- active Assessment of National, Regional and Global Vulnerability of Coastal Zones to Climate Change and Sea-Level Rise (DINAS-COAST). [] 4.2Advanced Terrestrial EcosystemAnalysis andModelling [] Socio-economic data were used to assess adaptive capacity on a sub-national scale, in a way that allowed it to be projected into the future using the same set of scenarios as for the assessment of po- tential impacts. []	CAN'T TELL			

Reporting of	ATEAM:		-	
indicators/questions	2ndary data			
used to				
operationalise				
construct?				
Sampling strategies	ATEAM:			
reported?	2ndary data			
Sampling sizes	ATEAM:			
reported?	2ndary data			
Data analysis	ATEAM:	4.2Advanced Terrestrial EcosystemAnalysis andModelling		
methods reported?	Yes	[]		
		Adaptive capacity was modelled as an index that was		
		chosen to be a real number between 0 and 1. It was		
		developed by building a statistical model from observed		
		socio-economic data, which was then applied to the IPCC		
		SRES scenarios to produce future projections of adaptive		
		capacity. The adaptive capacity index can be seen within		
		our framework as an estimate of the size of the set of		
		available actions Uk. The socio-economic data used to		
		derive the index (e.g.,GDPper capita, literacy rate and		
		labour participation rate of women) indicate the capac-		
		ity of society to prepare for and respond to impacts of		
		global change by choosing an appropriate action (i.e.,		
		ecosystem management strategy). The size of this set of		
		actions can be assumed to be an indication of the size of		
		the set of effective actions, since the latter is a subset of		
		the former.		

Structured summary of operationalization – validity assessment			1.1 DCM	1.2 valid	1.	2. Feasible?
Construct: adaptive capacity as set			Appropriate	empirical	conclusion -	
Article: Ionesco et al (2009)				rep?	Valid?	
<u>Criterion</u>	<u>Assessment</u>	Quoted text or Rationale for negative assessment				
Construct defined?	Yes	Definition (Adaptive capacity as a set) The adaptive	Yes/ no/ can't	Yes/ no/	Yes/ no/	Yes/ no/

		capacity of a system f in state x subjected to an input e is represented by the set of its effective actions.	tell	can't tell	can't tell	can't tell
Data collection methods reported?	DINAS: 2ndary data	The objective of this section is to relate the framework developed in Section 3 to the IPCCconceptualisation of vulnerability (see Fig. 1) and to two recent vulnerability assessments:Advanced Terrestrial EcosystemAnalysis and Modelling (ATEAM) and Dynamic and Inter- active Assessment of National, Regional and Global Vulnerability of Coastal Zones to Climate Change and Sea-Level Rise (DINAS-COAST). [] 4.3 Dynamic and InteractiveAssessment of National, Regional and Global Vulnerability of Coastal Zones to Climate Change and Sea-Level Rise [] The project DINAS-COAST (http://www.dinas-coast. net) was also funded by the Research Directorate- General of the European Commission from 2001 to 2004. Five partners and two subcontractors worked together to develop the dynamic, interactive and flexi- ble tool Dynamic and Interactive VulnerabilityAssess- ment (DIVA, [5]). DIVA enables its users to assess coastal vulnerability to sea-level rise and to explore possible adaptation policies.	CAN'T TELL		CAN'T TELL	
Reporting of indicators/questions used to operationalise construct?	DINAS: 2ndary data					
Sampling strategies reported?	DINAS: 2ndary data					
Sampling sizes reported?	DINAS: 2ndary data					
Data analysis methods reported?	DINAS: Yes	4.3 Dynamic and InteractiveAssessment of National, Regional and Global Vulnerability of Coastal Zones to				

Г			
	Climate Change and Sea-Level Rise		
	[]		
	In contrast toATEAM, the transition function of the		
	coupled human-environment system was known and has		
	the form of Eq. 19. In addition to the input, controls (i.e.,		
	adaptation actions) were included in the model. The		
	actions contained in the set of controls U were (1) do		
	nothing, (2) build dikes, (3) move away and (4) nourish		
	the beach or tidal basins. Given f, U and a set of scenarios E,		
	the vulnerability		
	of the system could have been assessed by computing the		
	transition of the system for every adaptation action		
	$u \in U$ and comparing the resulting set of possible states		
	Xk+1 with the previous state xk. However, doing so would		
	be computationally expensive. Instead, DIVA		
	introduced adaptation policies. An adaptation policy is a		
	function that returns an adaptation action u for every		
	state of the system and input it receives from the		
	environment:		
	$\phi: X \times E \rightarrow U, \phi(xk, ek) = uk . (21)$		
	The following adaptation policies were considered:		
	No adaptation: the model computes only potential		
	impacts.		
	• Full protection: raise dikes or nourish beaches as much		
	as is necessary to preserve the status quo		
	(i.e., x0).		
	Optimal protection: optimisation based on the		
	comparison of the monetary costs and benefits of		
	adaptation actions and potential impacts.		
	• User-defined protection: the user defines a flood return		
	period against which to protect.		
	The composition of the adaptation policy ϕ with		
	the state transition function f transforms the non-		
	deterministic system into a deterministic one:		
	$xk+1 = f(xk, ek, uk) = f(xk, ek, \phi(xk, ek)) = f @(xk, ek). (22)$		

Structured summary	of operationaliz	ation – validity assessment	1.1 DCM	1.2 valid	1.	2. Feasible?
Construct: Entity			Appropriate	empirical	conclusion -	
Article: Ionesco et al (2009)				rep?	Valid?	
<u>Criterion</u>	<u>Assessment</u>	Quoted text or Rationale for negative assessment				
Construct defined?	Yes	The mainstream mathematical interpretation of an entity is that of a dynamical system in a given state. This is the interpretation we will adopt here	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell
Data collection methods reported?	ATEAM: 2ndary data	The objective of this section is to relate the framework developed in Section 3 to the IPCCconceptualisation of vulnerability (see Fig. 1) and to two recent vulnerability assessments:Advanced Terrestrial EcosystemAnalysis and Modelling (ATEAM) and Dynamic and Inter- active Assessment of National, Regional and Global Vulnerability of Coastal Zones to Climate Change and Sea-Level Rise (DINAS-COAST). [] 4.2Advanced Terrestrial EcosystemAnalysis andModelling [] It involved 13 partners and six subcontractors, whose joint activities resulted in the development of a vulnerability mapping tool [21]. The project adopted the IPCC conceptualisation of vul- nerability, which required combining information on potential impactswith information on adaptive capacity (see Fig. 1). Socio- economic data were used to assess adaptive capacity on a sub-national scale, in a way that allowed it to be projected into the future using the same set of scenarios as for the assessment of po- tential impacts. The information on potential impacts and adaptive capacity was then combined in a series of vulnerability maps [25].	CAN'T TELL		CAN'T TELL	
Reporting of indicators/questions used to operationalise construct?	ATEAM: 2ndary data			-		
Sampling strategies reported?	ATEAM: 2ndary data					

Conceling since	ATE A N.4.		
Sampling sizes reported?	ATEAM: 2ndary data		
-			
Data analysis methods reported?	ATEAM: Yes	4.2Advanced Terrestrial EcosystemAnalysis andModelling [] ATEAM aimed "to assess where in Europe people may be vulnerable to the loss of particular ecosystem services, associated with the combined effects of climate change, land use change and atmospheric pollution" ([22], p. 3). Thus, the entity is a coupled human–ecological system: the people in Europe who rely on ecosystem services. The system receives both input (the stimuli) and controls (the human actions). The evolution of such a system can be given by xk+1 = f (xk, ek,uk), (19) where k denotes the time step and uk is an element of the set of available controls Uk, which are the man-	
		agement actions people can apply to adapt to poten- tial impacts and, thus, maintain the ecosystem services on which they rely. These actions are usually specific to the ecosystem service considered. For example, a management action for ensuring the ecosystem service "agriculture" could be to irrigate the land.	

Structured summary of operationalization – validity assessment			1.1 DCM	1.2 valid	1.	2. Feasible?
Construct: Entity			Appropriate	empirical	conclusion -	
Article: lonesco et al (2009)				rep?	Valid?	
<u>Criterion</u>	Assessment	Quoted text or Rationale for negative assessment				
Construct defined?	Yes	The mainstream mathematical interpretation of an entity	Yes/ no/ can't	Yes/ no/	Yes/ no/	Yes/ no/
		is that of a dynamical system in a given state. This is the interpretation we will adopt here	tell	can't tell	can't tell	can't tell
Data collection		The objective of this section is to relate the framework	CAN'T TELL		CAN'T TELL	
methods reported?	DINAS:	developed in Section 3 to the IPCCconceptualisation of				

	r			
	2ndary data	vulnerability (see Fig. 1) and to two recent vulnerability		
		assessments:Advanced Terrestrial EcosystemAnalysis and		
		Modelling (ATEAM) and Dynamic and Inter- active		
		Assessment of National, Regional and Global Vulnerability		
		of Coastal Zones to Climate Change and Sea-Level Rise		
		(DINAS-COAST).		
		[]		
		4.2Advanced Terrestrial EcosystemAnalysis andModelling		
		[]		
		It involved 13 partners and six subcontractors, whose		
		joint activities resulted in the development of a		
		vulnerability mapping tool [21]. The project adopted the		
		IPCC conceptualisation of vul- nerability, which required		
		combining information on potential impacts with		
		information on adaptive capacity (see Fig. 1). Socio-		
		economic data were used to assess adaptive capacity on a		
		sub-national scale, in a way that allowed it to be		
		projected into the future using the same set of scenarios		
		as for the assessment of po-tential impacts. The		
		information on potential impacts and adaptive capacity		
		was then combined in a series of vulnerability maps [25].		
		[]		
		4.3 Dynamic and InteractiveAssessment of National,		
		Regional and Global Vulnerability of Coastal Zones to		
		Climate Change and Sea-Level Rise		
		[]		
		The project DINAS-COAST (http://www.dinas-coast. net)		
		was also funded by the Research Directorate- General of		
		the European Commission from 2001 to 2004. Five		
		partners and two subcontractors worked together to		
		develop the dynamic, interactive and flexi- ble tool		
		Dynamic and Interactive VulnerabilityAssess- ment (DIVA,		
		[5]). DIVA enables its users to assess coastal vulnerability		
		to sea-level rise and to explore possible adaptation		
		policies.		
Reporting of			-	
indicators/questions	DINAS:			
used to	2ndary data			

operationalise construct?				
Sampling strategies reported?	DINAS: 2ndary data			
Sampling sizes reported?	DINAS: 2ndary data			
Data analysis methods reported?	DINAS: Yes	 4.2Advanced Terrestrial EcosystemAnalysis andModelling [] ATEAM aimed "to assess where in Europe people may be vulnerable to the loss of particular ecosystem services, associated with the combined effects of climate change, land use change and atmospheric pollution" ([22], p. 3). Thus, the entity is a coupled human–ecological system: the people in Europe who rely on ecosystem services. The system receives both input (the stimuli) and controls (the human actions). The evolution of such a system can be given by xk+1 = f (xk, ek,uk), (19) where k denotes the time step and uk is an element of the set of available controls Uk, which are the management actions people can apply to adapt to poten- tial impacts and, thus, maintain the ecosystem services on which they rely. These actions are usually specific to the ecosystem service considered. For example, a management action for ensuring the ecosystem service "agriculture" could be to irrigate the land. [] 4.3 Dynamic and InteractiveAssessment of National, Regional and Global Vulnerability of Coastal Zones to Climate Change and Sea-Level Rise [] The first primitive, the vulnerable entity, is the coastal system. 		

Structured summary	of operationaliz	ration – validity assessment	1.1 DCM	1.2 valid	1.	2. Feasible?
Construct: preference	e criteria		Appropriate	empirical	conclusion -	
Article: Ionesco et al (2009)		7	rep?	Valid?	
Criterion	Assessment	Quoted text or Rationale for negative assessment				
Construct defined?	Yes	Definition (Hazard, potential impact) An input $e \in E$ is a hazard for a system f in state x if $\exists u \in U : f(x, e, u) \prec f(x, e*, u*)$. In this case, f(x, e, u) is called a potential impact.	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell CAN'T TELL	Yes/ no/ can't tell
Data collection methods reported?	ATEAM: 2ndary data	The objective of this section is to relate the framework developed in Section 3 to the IPCCconceptualisation of vulnerability (see Fig. 1) and to two recent vulnerability assessments:Advanced Terrestrial EcosystemAnalysis and Modelling (ATEAM) and Dynamic and Inter- active Assessment of National, Regional and Global Vulnerability of Coastal Zones to Climate Change and Sea-Level Rise (DINAS-COAST). [] 4.2Advanced Terrestrial EcosystemAnalysis andModelling [] It involved 13 partners and six subcontractors, whose joint activities resulted in the development of a vulnerability mapping tool [21]. The project adopted the IPCC conceptualisation of vul- nerability, which required combining information on potential impactswith information on adaptive capacity (see Fig. 1). Socio- economic data were used to assess adaptive capacity on a sub-national scale, in a way that allowed it to be projected into the future using the same set of scenarios as for the assessment of po- tential impacts. The information on potential impacts and adaptive capacity was then combined in a series of vulnerability maps [25].	CAN'T TELL			
Reporting of indicators/questions used to operationalise	ATEAM: 2ndary data			-		

construct?				
Sampling strategies reported?	ATEAM: 2ndary data			
Sampling sizes reported?	ATEAM: 2ndary data			
Data analysis methods reported?	ATEAM: Yes	 4.2Advanced Terrestrial EcosystemAnalysis andModelling [] The third primitive notion concerns the preference criteria represented by a (partial) strict order ≺, which relate to the loss of ecosystem services. We will discuss the preference criteria in more detail below. [] The (partial) strict order was therefore developed in consultation with stakeholders in the form of an impact function on the set of states (also referred to as output or indicator function), in a similar way as shown in Example 3. The impact function reduces the thematic components of the state vector to a single real number between 0 and 1 for each ecosystem service. 		

Structured summary	Structured summary of operationalization – validity assessment			1.2 valid	1.	2. Feasible?
Construct: preference	Construct: preference criteria		Appropriate	empirical	conclusion -	
Article: lonesco et al (2009)			rep?	Valid?		
<u>Criterion</u>	Assessment	Quoted text or Rationale for negative assessment	-			
Construct defined?	Yes	Definition (Hazard, potential impact) An input $e \in E$ is a hazard for a system f in state x if $\exists u \in U : f(x, e, u) \prec f(x, e*, u*)$. In this case, f(x, e, u) is called a potential impact.	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell CAN'T TELL	Yes/ no/ can't tell
Data collection methods reported?	DINAS: 2ndary data	The objective of this section is to relate the framework developed in Section 3 to the IPCCconceptualisation of vulnerability (see Fig. 1) and to two recent vulnerability	CAN'T TELL			

		assessments:Advanced Terrestrial EcosystemAnalysis and Modelling (ATEAM) and Dynamic and Inter- active Assessment of National, Regional and Global Vulnerability of Coastal Zones to Climate Change and Sea-Level Rise (DINAS-COAST). [] [] 4.3 Dynamic and InteractiveAssessment of National, Regional and Global Vulnerability of Coastal Zones to Climate Change and Sea-Level Rise [] The project DINAS-COAST (http://www.dinas-coast. net) was also funded by the Research Directorate- General of the European Commission from 2001 to 2004. Five partners and two subcontractors worked together to develop the dynamic, interactive and flexi- ble tool Dynamic and Interactive VulnerabilityAssess- ment (DIVA, [5]). DIVA enables its users to assess coastal vulnerability to sea-level rise and to explore possible adaptation policies.		
Reporting of indicators/questions used to operationalise construct?	DINAS: 2ndary data		-	
Sampling strategies reported?	DINAS: 2ndary data			
Sampling sizes reported?	DINAS: 2ndary data			
Data analysis methods reported?	DINAS: Yes	[] 4.3 Dynamic and InteractiveAssessment of National, Regional and Global Vulnerability of Coastal Zones to Climate Change and Sea-Level Rise [] The third primitive, the partial strict order was given in the form of an impact function on the set of states. The		

function computes additional diagnostic properties such		
as people at risk of flooding, land loss, economic damages		
and the cost of protecting the coast. In con- trast to		
ATEAM, the impact function does not re- duce and		
normalise the dimensions of the state vector. One could		
say that DINAS-COAST provides a sparser partial strict		
order than ATEAM. Only the vector's monetary		
components can be directly compared, which is also the		
basis for the optimal protection policy. The comparison of		
the vector's non-monetary components is left to the		
individual user, as is the choice of a reference scenario		
and reference control policy. For this purpose the model		
is provided with a graphical user interface that allows for		
the visual comparison of the outputs for different regions,		
time steps, scenarios and adaptation policies in form of		
graphs, tables and maps.		

Structured summary	of operationaliz	zation – validity assessment	1.1 DCM	1.2 valid	1.	2. Feasible?
Construct: reference	scenarios		Appropriate	empirical	conclusion -	
Article: Ionesco et al	(2009)			rep?	Valid?	
<u>Criterion</u>	Assessment	Quoted text or Rationale for negative assessment				
Construct defined?	Yes	The examples provided also have this "punctual" or "one- step" character. However, in many applications, it is more natural to consider an evolution of the system to be a sequence of states, and to consider scenarios and reference scenarios instead of punctual inputs for the vulnerability assessment. A scenario is just a sequence of inputs: es =[e1, e2,, en]. Corresponding to such a sequence, the sys- tem will undergo n transitions, xs =[x0, x1,, xn]	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell CAN'T TELL	Yes/ no/ can't tell
Data collection methods reported?	ATEAM: 2ndary data	The objective of this section is to relate the framework developed in Section 3 to the IPCCconceptualisation of vulnerability (see Fig. 1) and to two recent vulnerability assessments:Advanced Terrestrial EcosystemAnalysis and Modelling (ATEAM) and Dynamic and Inter- active	CAN'T TELL			

		Assessment of National, Regional and Global Vulnerability of Coastal Zones to Climate Change and Sea-Level Rise (DINAS-COAST). [] 4.2Advanced Terrestrial EcosystemAnalysis andModelling [] It involved 13 partners and six subcontractors, whose joint activities resulted in the development of a vulnerability mapping tool [21]. The project adopted the IPCC conceptualisation of vul- nerability, which required combining information on potential impactswith information on adaptive capacity (see Fig. 1). Socio- economic data were used to assess adaptive capacity on a sub-national scale, in a way that allowed it to be projected into the future using the same set of scenarios as for the assessment of po- tential impacts. The information on potential impacts and adaptive capacity was then combined in a series of vulnerability maps [25]. []		
Reporting of indicators/questions used to operationalise construct?	ATEAM: 2ndary data		-	
Sampling strategies reported?	ATEAM: 2ndary data			
Sampling sizes reported?	ATEAM: 2ndary data			
Data analysis methods reported?	ATEAM: Yes	4.2Advanced Terrestrial EcosystemAnalysis andModelling [] To allow for such comparisons was one of the main objectives of ATEAM. Depending on the purposes of the assessment, the reference input could be chosen to be "no input", that is, the next state was compared to the current one, or one of the other inputs prepared in		

accordance to the SRES scenarios.		
[]		

Structured summary	of operationaliz	ation – validity assessment	1.1 DCM	1.2 valid	1.	2. Feasible?
Construct: reference	scenarios		Appropriate	empirical rep?	conclusion - Valid?	
Article: Ionesco et al	(2009)					
<u>Criterion</u>	<u>Assessment</u>	Quoted text or Rationale for negative assessment				
Construct defined?	Yes	The examples provided also have this "punctual" or "one- step" character. However, in many applications, it is more natural to consider an evolution of the system to be a sequence of states, and to consider scenarios and reference scenarios instead of punctual inputs for the vulnerability assessment. A scenario is just a sequence of inputs: es =[e1, e2,, en]. Corresponding to such a sequence, the sys- tem will undergo n transitions, xs =[x0, x1,, xn]	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell CAN'T TELL	Yes/ no/ can't tell
Data collection methods reported?	DINAS: 2ndary data	The objective of this section is to relate the framework developed in Section 3 to the IPCCconceptualisation of vulnerability (see Fig. 1) and to two recent vulnerability assessments:Advanced Terrestrial EcosystemAnalysis and Modelling (ATEAM) and Dynamic and Inter- active Assessment of National, Regional and Global Vulnerability of Coastal Zones to Climate Change and Sea-Level Rise (DINAS-COAST). [] 4.3 Dynamic and InteractiveAssessment of National, Regional and Global Vulnerability of Coastal Zones to Climate Change and Sea-Level Rise [] The project DINAS-COAST (http://www.dinas-coast. net) was also funded by the Research Directorate- General of the European Commission from 2001 to 2004. Five partners and two subcontractors worked together to develop the dynamic, interactive and flexi- ble tool	CAN'T TELL			

		Dynamic and Interactive VulnerabilityAssess- ment (DIVA, [5]). DIVA enables its users to assess coastal vulnerability to sea-level rise and to explore possible adaptation policies.		
Reporting of indicators/questions used to operationalise construct?	DINAS: 2ndary data		-	
Sampling strategies reported?	DINAS: 2ndary data			
Sampling sizes reported?	DINAS: 2ndary data			
Data analysis methods reported?	DINAS: Yes	 4.3 Dynamic and InteractiveAssessment of National, Regional and Global Vulnerability of Coastal Zones to Climate Change and Sea-Level Rise [] The comparison of the vector's non-monetary components is left to the individual user, as is the choice of a reference scenario and reference control policy. For this purpose the model is provided with a graphical user interface that allows for the visual comparison of the outputs for different regions, time steps, scenarios and adaptation policies in form of graphs, tables and maps. 		

Structured summary of operationalization – validity assessment			1.1 DCM	1.2 valid	1.	2. Feasible?
Construct: Stimulus		Appropriate	empirical	conclusion -		
Article: lonesco et al (2009)			rep?	Valid?		
<u>Criterion</u>	Assessment	Quoted text or Rationale for negative assessment	-			
Construct defined?	Yes	The stimuli to which such a system can be subjected are	Yes/ no/ can't	Yes/ no/	Yes/ no/	Yes/ no/
		then naturally represented by the inputs to the system.	tell	can't tell	can't tell	can't tell
		The simplest kind of dynamical system with input is a			CAN'T TELL	
		discrete, deter- ministic one, given by a transition				

		function (see [14]):			
		$f: X \times E \rightarrow X$, (1)			
Data collection	ATEAM:	The objective of this section is to relate the framework	CAN'T TELL		
methods reported?	Yes	developed in Section 3 to the IPCCconceptualisation of			
		vulnerability (see Fig. 1) and to two recent vulnerability			
		assessments:Advanced Terrestrial EcosystemAnalysis and			
		Modelling (ATEAM) and Dynamic and Inter- active			
		Assessment of National, Regional and Global Vulnerability			
		of Coastal Zones to Climate Change and Sea-Level Rise			
		(DINAS-COAST).			
		4.2Advanced Terrestrial EcosystemAnalysis andModelling			
		[]			
		It involved 13 partners and six subcontractors, whose joint activities resulted in the development of a			
		vulnerability mapping tool [21]. The project adopted the			
		IPCC conceptualisation of vul- nerability, which required			
		combining information on potential impacts with			
		information on adaptive capacity (see Fig. 1). Socio-			
		economic data were used to assess adaptive capacity on a			
		sub-national scale, in a way that allowed it to be			
		projected into the future using the same set of scenarios			
		as for the assessment of po- tential impacts. The			
		information on potential impacts and adaptive capacity			
		was then combined in a series of vulnerability maps [25].			
Reporting of	ATEAM:			-	
indicators/questions	2ndary data				
used to					
operationalise construct?					
Sampling strategies	ATEAM:				
reported?	2ndary data				
Sampling sizes	ATEAM:				
reported?	2ndary data				
Data analysis	ATEAM:	4.2Advanced Terrestrial EcosystemAnalysis andModelling			
methods reported?	Yes	[]			

The second primitive is the stimulus or input $e \in E$, to which the system's vulnerability was assessed. This		
input was given by the scenarios of climate, land use and		
nitrogen deposition, which represent the pos- sible		
evolutions of the environment. The scenarios were based		
on the IPCC SRES storylines (for details, see [22]).		
[]		
The transition function of the deterministic system can		
then be given by		
$xk+1 = f^{(k)}u(xk, ek)$. (20) This equation now allows for the computation of		
possible future states (i.e., xk+1) for the given scenarios.		
However, to assert that an entity is vulnerable, the third		
primitive, a (partial) strict order, is needed to compare		
different states (e.g., future states with present states,		
states determined by different scenarios or states of		
different regional sub-systems). In the case of ATEAM, the		
elements of the set of states X are vectors, so it is not		
trivial to provide an appropriate order relation.		
[]		

Structured summary	Structured summary of operationalization – validity assessment			1.2 valid	1.	2. Feasible?
Construct: Stimulus			Appropriate	empirical	conclusion -	
Article: Ionesco et al	(2009)		rep? Valid?			
<u>Criterion</u>	Assessment	Quoted text or Rationale for negative assessment				
Construct defined?	Yes	The stimuli to which such a system can be subjected are then naturally represented by the inputs to the system. The simplest kind of dynamical system with input is a discrete, deter- ministic one, given by a transition function (see [14]): $f: X \times E \rightarrow X$, (1)	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell CAN'T TELL	Yes/ no/ can't tell
Data collection methods reported?	DINAS: Yes	The objective of this section is to relate the framework developed in Section 3 to the IPCCconceptualisation of vulnerability (see Fig. 1) and to two recent vulnerability	CAN'T TELL			

		assessments:Advanced Terrestrial EcosystemAnalysis and Modelling (ATEAM) and Dynamic and Inter- active Assessment of National, Regional and Global Vulnerability of Coastal Zones to Climate Change and Sea-Level Rise (DINAS-COAST). [] 4.3 Dynamic and InteractiveAssessment of National, Regional and Global Vulnerability of Coastal Zones to Climate Change and Sea-Level Rise [] The project DINAS-COAST (http://www.dinas-coast. net) was also funded by the Research Directorate- General of the European Commission from 2001 to 2004. Five partners and two subcontractors worked together to develop the dynamic, interactive and flexi- ble tool Dynamic and Interactive VulnerabilityAssess- ment (DIVA, [5]). DIVA enables its users to assess coastal vulnerability to sea-level rise and to explore possible adaptation policies.		
Reporting of indicators/questions used to operationalise construct?	DINAS: 2ndary data		-	
Sampling strategies reported?	DINAS: 2ndary data			
Sampling sizes reported?	DINAS: 2ndary data			
Data analysis methods reported?	DINAS: Yes	 4.3 Dynamic and InteractiveAssessment of National, Regional and Global Vulnerability of Coastal Zones to Climate Change and Sea-Level Rise [] The second primitive, the stimulus or input to which the entity's vulnerability was assessed, was given in the form 		

of climate, land-use and socio-economic scenarios				
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Transparency Assessment Article s	summary	
Article	Jamir et al (2013)	
Transparent operationalizations	Agricultural; biophysical; demographic; socio-economic	
Partially transparent		
Not transparent	Adaptive capacity ; Drought; Exposure; Sensitivity	

Structured summary	mary of operationalization – validity assessment			1.1 DCM	2. Feasible?			
Construct: Agricultura	al				Appropriate	empirical	conclusion -	
Article: Jamir et al (20)13)					rep?	Valid?	
Criterion	Assessment	Quoted text or Ra	tionale for negativ	e assessment				
Construct defined?	Defined by reference	On the lines of Pat	On the lines of Patnaik and Narayanan (2009), t			Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell
Data collection methods reported?	Yes	appraisal (PRA) we order to quantify households (30 ho randomly selected questionnaire surv group discussions group discussions members and dist local problems. [] Based on the resp council members of mean, minimum a indicators were ob those indicators th approach.	ere conducted in a each of these indic ouseholds in each w l across the village vey. The PRA was i and semi-structur with the communi- rict offi- cials gave onse of the farmer during household s nd maximum valu- otained. Secondary nat could not be qu	s for the household in the form of focus ed interviews. The ity, village council an insight into the sand the village surveys and PRA, the es for each of the data were used for uantified by this	YES		YES	YES
Reporting of	Yes	Table 3 Indicators	of sources of vuln	erability		YES		
indicators/questions used to operationalise		Component indicators	Indicator description (Table 2)	Indicator units (Table 2)				

construct2	A	Tatalan	Anna /hr.//		
onstruct?	Area under	Total area	Area (ha/ acre/		
	shifting	under shifting	local unit)		
	cultivation	cultivation with			
		less fallow			
		periods (2–4			
		years)			
	Total area	The total area	Area (ha/ acre/		
	under rainfed	cultivated by	local unit)		
	agriculture	the farmers,			
		which is			
		dependent			
		directly on			
		rainfall for			
		irrigation			
		(whether under			
		settled or			
		shifting			
		cultivation)			
	Total area	The total	Area (ha/ acre/		
			local unit)		
	under irrigated	agriculture area			
	crops	under manually			
		irrigated crops			
		(during kharif			
		as well as rabi			
		seasons)			
	Irrigation	Total number	Days/year		
	availability	of days			
		irrigation			
		available per			
		year			
	Average crop	The inverse of	Number		
	diversity index	(the number of			
		crops grown by			
		a household ?1)			
	Total number	Total number	Number		
	of kharif crops	of crops grown	Number		
		during kharif or			
	grown				
		rainfed season			

of the year Total number Total number of rabi crops of crops grown grown during rabi and zaid seasons of the year (non- major cropping seasons) Total annual Total annual crop crop production production in the village of major crops including kharif and rabi crops Extent of Ratio of the dryland arols of the agroup non-irrigated agricultural agricultural
of rabi crops grown of crops grown during rabi and zaid seasons of the year (non- major cropping seasons)
grownduring rabi and zaid seasons of the year (non- major cropping seasons)Total annual crop productionTotal annual rotal annualTotal annual crop productionTons/yearTotal annual crop productionTons/yearExtent of drylandRatio of the rotal ane or non-irrigated
zaid seasons of the year (non- major cropping seasons)the year (non- major cropping seasons)Total annual crop productionTotal annual rons/yearTotal annual crop productionTons/yearincluding kharif and rabi cropsTotal annual including kharif and rabi cropsExtent of drylandRatio of the dryland area or non-irrigated
the year (non- major cropping seasons)Total annual cropTotal annual rotal annualTotal annual cropTotal annual production in the village of major crops including kharif and rabi cropsExtent of drylandRatio of the dryland area or non-irrigated
major cropping seasons)Total annual cropTotal annual cropTons/yearproduction productionproduction in the village of major crops including kharif and rabi cropsHerein and rabi cropsExtent of drylandRatio of the dryland area or non-irrigatedNumber
Image: seasons blackseasons blackTotal annual cropTotal annual cropTons/yearproductionproduction in the village of major crops including kharif and rabi cropsImage: seasons blackExtent of drylandRatio of the dryland area or non-irrigatedNumber
Total annual cropTotal annual cropTons/yearproductionproduction in the village of major crops including kharif and rabi cropsTons/yearExtent of drylandRatio of the dryland area or non-irrigatedNumber
crop crop production production in the village of major crops including kharif and rabi crops Extent of Ratio of the dryland dryland area or non-irrigated
production production in the village of major crops including kharif and rabi crops Extent of Ratio of the dryland dryland area or non-irrigated
production production in the village of major crops including kharif and rabi crops Extent of Ratio of the dryland dryland area or non-irrigated
major crops including kharif and rabi crops Extent of Ratio of the dryland dryland area or non-irrigated Number
major crops including kharif and rabi crops Extent of dryland orphild non-irrigated
including kharif and rabi crops Extent of Ratio of the Number dryland dryland area or non-irrigated
and rabi crops Extent of Ratio of the dryland dryland area or non-irrigated Image: Comparison of the state of th
Extent of drylandRatio of the dryland area or non-irrigatedNumber
dryland dryland area or non-irrigated
non-irrigated
land to the
total
geographical
area of the
village
Crop area Total area Area (ha/
affected under acre/local unit)
cultivation
affected by
droughts
Value of crops The type and INR
lost amount of crop
sown and its
market price
during the time
of crop loss
taken as proxy
Sampling strategies Yes Household questionnaire surveys and participatory rural

		and an to available and a fith and indicators A total of 450		
		order to quantify each of these indicators. A total of 150		
		households (30 households in each village) were		
		randomly selected across the villages for the household		
		questionnaire survey.		
Sampling sizes	Yes	Household questionnaire surveys and participatory rural		
reported?		appraisal (PRA) were conducted in all the five villages in		
		order to quantify each of these indicators. A total of 150		
		households (30 households in each village) were		
		randomly selected across the villages for the household		
		questionnaire survey.		
Data analysis	Yes	Based on the data obtained from the household survey		
methods reported?		and the PRA, four indices, corresponding to the four		
		sources of vulnerability—biophysical, agricultural,		
		demographic and socio-economic, were computed for all		
		the villages. Data gaps were bridged by using secondary		
		data, where avail- able. Table 4 shows the average		
		biophysical, agricultural, demographic and socio-		
		economic vulnerability indices for these villages.		
		Following the calculation of the indices, they were		
		assigned weights based on the ranks given to the sources		
		of vulnerability by the farmers themselves during the		
		PRA. A rank of 4 indicates very high contribution to		
		vulnerability. Ranks 3, 2 and 1 indicate high, moderate		
		and low contri- bution of a particular source to overall		
		vulnerability, respectively. The final weight to be		
		apportioned was cal- culated by the following formula:		
		Average of the ranks assigned in the five villages Sumof		
		the ranks		
		Table 5 shows the weights apportioned to the average		
		vulnerability indices for calculatingvillage-		
		levelvulnerability.		
		After weights were assigned to the biophysical, agri-		
		cultural, socio-economic and demographic indices, a		
		composite vulnerability index, representative of the		
		climate variability-induced drought vulnerability of the		
		resident farmers, was calculated (as per Patnaik and		
		Narayanan 2009). The weighted biophysical, agricultural		
		and socio- economic vulnerability indices of the villages		

were calcu- lated by multiplying the apportioned weight by the average index calculated for each source of vulnerability.		
[]		
The composite vulnerability indices for each of the villages were calculated using the following formula: V ¼		
hi1=4 4		
Pn i¼1 ðAverage indexi 🛛 WeightiÞ		

Structured summary	of operationaliz	zation – validity asse	essment		1.1 DCM	1.2 valid	1.	2. Feasible?
Construct: Biophysica	I				Appropriate	empirical	conclusion -	
Article: Jamir et al (20	13)					rep?	Valid?	
<u>Criterion</u>	Assessment	Quoted text or Rat	tionale for negative	assessment				
Construct defined?	Defined by reference	On the lines of Pat	On the lines of Patnaik and Narayanan (2009), Ye te			Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell
Data collection methods reported?	Yes	appraisal (PRA) we order to quantify a households (30 ho randomly selected questionnaire surv group discussions group discussions members and dist local problems. [] Based on the resp council members of mean, minimum a indicators were ob	ere conducted in all each of these indica useholds in each vi across the villages vey. The PRA was in and semi-structure with the communit rict offi- cials gave a onse of the farmers during household sin nd maximum value	for the household the form of focus d interviews. The ry, village council an insight into the s and the village urveys and PRA, the s for each of the data were used for	YES		YES	YES
Reporting of indicators/questions	Yes/no	Component	f sources of vulner Indicator	Indicator units		YES		
used to		indicators	description	(Table 2)				

operationalise			(Table 2)				
construct?		Extreme	Number of	Number			
		climate events	years				
			experiencing				
			rainfall deficit				
			or droughts				
			taken as a				
			proxy				
		Drought	Total amount	Months			
		duration	of time the				
			drought-like				
			conditions				
			persist in the				
			village				
		Drinking water	Approximate	Liters/			
		availability	amount of	individual			
			drinking water				
			available during				
			droughts				
			irrespective of				
			source				
Sampling strategies	Yes	-	-	l participatory rural	l		
reported?				the five villages in			
				tors. A total of 150			
			useholds in each vi				
			-	for the household			
		questionnaire surv					
Sampling sizes	Yes			participatory rural			
reported?				the five villages in			
				ators. A total of 150			
		-	useholds in each vi				
			-	for the household			
Data analysis	Vee	questionnaire surv		have a hald a server			
Data analysis	Yes		obtained from the	•			
methods reported?			indices, correspond	-			
			bility—biophysical,	-			
				ere computed for al			
		Life villages. Data g	saps were bridged i	by using secondary			

r			
	data, where avail- able. Table 4 shows the average		
	biophysical, agricultural, demographic and socio-		
	economic vulnerability indices for these villages.		
	Following the calculation of the indices, they were		
	assigned weights based on the ranks given to the sources		
	of vulnerability by the farmers themselves during the		
	PRA. A rank of 4 indicates very high contribution to		
	vulnerability. Ranks 3, 2 and 1 indicate high, moderate		
	and low contri- bution of a particular source to overall		
	vulnerability, respectively. The final weight to be		
	apportioned was cal- culated by the following formula:		
	Average of the ranks assigned in the five villages Sumof		
	the ranks		
	Table 5 shows the weights apportioned to the average		
	vulnerability indices for calculatingvillage-		
	levelvulnerability.		
	After weights were assigned to the biophysical, agri-		
	cultural, socio-economic and demographic indices, a		
	composite vulnerability index, representative of the		
	climate variability-induced drought vulnerability of the		
	resident farmers, was calculated (as per Patnaik and		
	Narayanan 2009). The weighted biophysical, agricultural		
	and socio- economic vulnerability indices of the villages		
	were calcu- lated by multiplying the apportioned weight		
	by the average index calculated for each source of		
	vulnerability.		
	[]		
	The composite vulnerability indices for each of the		
	villages were calculated using the following formula: V ¹ / ₄		
	hi1=4 4		
	Pn i¼1 ðAverage indexi 🛛 WeightiÞ		

Structured summary of operationalization – validity assessment	1.1 DCM	1.2 valid	1.	2. Feasible?
Construct: Demographic	Appropriate	empirical	conclusion -	
Article: Jamir et al (2013)		rep?	Valid?	

<u>Criterion</u>	<u>Assessment</u>	Quoted text or Ra	tionale for negative	e assessment				
Construct defined?	Defined by reference		tnaik and Narayana		Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell
Data collection methods reported?	Yes	appraisal (PRA) we order to quantify households (30 ho randomly selected questionnaire sur- group discussions group discussions members and dist local problems. [] Based on the resp council members mean, minimum a indicators were of	ere conducted in al each of these indica ouseholds in each v d across the villages vey. The PRA was ir and semi-structure with the communi crict offi- cials gave onse of the farmer during household s and maximum value otained. Secondary	s for the household in the form of focus ed interviews. The ty, village council an insight into the s and the village urveys and PRA, the es for each of the data were used for	tell YES	can't tell	can't tell YESS	can't tell YESS
Reporting of indicators/questions used to	Yes	approach.	of sources of vulne Indicator description	-		YES		
operationalise construct?		Rural population density	(Table 2) Total rural population of the village divided by the geographical area of the village	Percentage				
		Percentage of small- scale farmers Percentage of	Percentage of small-scale farmers (with land holding between 1.0 and 1.99 ha) Percentage of	Percentage Percentage				

		monginal	marginal			
		marginal	marginal			
		farmers	farmers (with			
			land			
			holding\1ha)			
		Literacy rate	Percentage of	Percentage		
			literate			
			members in the			
			household			
Sampling strategies	Yes	Household question	onnaire surveys and	l participatory rural		
reported?		appraisal (PRA) we	ere conducted in all	the five villages in		
		order to quantify e	each of these indica	tors. A total of 150		
		households (30 ho	useholds in each vi	llage) were		
		randomly selected	l across the villages	for the household		
		questionnaire surv	/ey.			
Sampling sizes	Yes	Household question	onnaire surveys and	participatory rural		
reported?		appraisal (PRA) we	ere conducted in all	the five villages in		
		order to quantify e	each of these indica	tors. A total of 150		
		households (30 ho	useholds in each vi	llage) were		
		randomly selected	l across the villages	for the household		
		questionnaire surv	/ey.			
Data analysis	Yes	Based on the data	obtained from the	household survey		1
methods reported?		and the PRA, four	indices, correspond	ling to the four		
		sources of vulnera	bility—biophysical,	agricultural,		
		demographic and	socio-economic, w	ere computed for all		
		the villages. Data	gaps were bridged	by using secondary		
		data, where avail-	able. Table 4 show	s the average		
			ltural, demographi	-		
		economic vulnera	bility indices for the	ese villages.		
		Following the calc	ulation of the indic	es, they were		
		assigned weights b	based on the ranks	given to the sources	5	
			the farmers thems	-		
			dicates very high c	-		
			s 3, 2 and 1 indicat			
		-	tion of a particular	-		
			ectively. The final v			
			al- culated by the f	•		
			iks assigned in the			
		the ranks				

Table 5 shows the weights apportioned to the average vulnerability indices for calculatingvillage- levelvulnerability. After weights were assigned to the biophysical, agri- cultural, socio-economic and demographic indices, a composite vulnerability index, representative of the climate variability-induced drought vulnerability of the resident farmers, was calculated (as per Patnaik and Narayanan 2009). The weighted biophysical, agricultural and socio- economic vulnerability indices of the villages were calcu- lated by multiplying the apportioned weight by the average index calculated for each source of vulnerability. [] The composite vulnerability indices for each of the villages were calculated using the following formula: V ¼ bi1=4.4		
villages were calculated using the following formula: V ¼ hi1=4 4 Pn i¼1 ðAverage indexi ⊠WeightiÞ		

Structured summary	of operationaliz	zation – validity assessment	1.1 DCM	1.2 valid	1.	2. Feasible?
Construct: Socio-ecor	omic		Appropriate	empirical	conclusion -	
Article: Jamir et al (20)13)			rep?	Valid?	
<u>Criterion</u>	<u>Assessment</u>	Quoted text or Rationale for negative assessment				
Construct defined?	Defined by	On the lines of Patnaik and Narayanan (2009),	Yes/ no/ can't	Yes/ no/	Yes/ no/	Yes/ no/
	reference		tell	can't tell	can't tell	can't tell
Data collection methods reported?	Yes	Household questionnaire surveys and participatory rural appraisal (PRA) were conducted in all the five villages in order to quantify each of these indicators. A total of 150 households (30 households in each village) were randomly selected across the villages for the household questionnaire survey. The PRA was in the form of focus group discussions and semi-structured interviews. The group discussions with the community, village council	YES		YES	YES

Demonstring of	Yes	local problems. [] Based on the response council members of mean, minimum an indicators were ob those indicators th approach.	rict offi- cials gave an onse of the farmers an luring household surv nd maximum values fi tained. Secondary da at could not be quan	nd the village eys and PRA, the or each of the ta were used for cified by this	YES	
Reporting of indicators/questions used to operationalise	res	Component indicators	of sources of vulneral Indicator description (Table 2)	Indicator units (Table 2)	YES	
construct?		Net Farm income	Total amount of farm income from the agricultural activities carried out by the farmer	INR		
		Average Farm size	Total size of the farm used for cultivation by the farmers	Area (ha/ acre/local unit)		
		Farm assets	Total number of tractors, farm equipments, storage facility, manure and pesticides used by the farmer	Number		
		Access to market	The distance travelled by the farmers to the village or town markets to sell their farm products and procure farm inputs on their	Distance (km)		

	I			
	own or through			
	some			
	intermediaries.			
Access to health	Distance travelled	Distance (km)		
facilities	by the farmers to			
	reach the nearest			
	dispensary/public			
	health centre or			
	hospital			
Access to bank	Percentage of	Distance (km)		
	farmers having an			
	account in the			
	nearest rural			
	banks			
Alternative	Sub-indicators			
livelihood	addressing			
options	alternate means			
	of earning			
	livelihood (other			
	than crop			
	cultivation, etc.)			
	such as			
	dependence on			
	forests, livestock,			
	etc.			
Awareness of	Percentage of	Percentage		
drought	households	rereentuge		
preparedness	having access to			
and mitigation	newspapers,			
measures	radio, television,			
	drought			
	awareness			
	programs, etc.			
Compensation	taken as proxy			
Compensation	Total amount of	INR		
received from	compensation			
Government	received by the			
due to losses	drought-affected			

Sampling strategies reported?	Yes	incurred during a drought/famine farmers from the Government agencies, private donor organizations or NGOs Government agencies, private donor organizations or NGOs Household questionnaire surveys and participatory rural appraisal (PRA) were conducted in all the five villages in order to quantify each of these indicators. A total of 150 households (30 households in each village) were randomly selected across the villages for the household
Sampling sizes reported?	Yes	questionnaire survey.Household questionnaire surveys and participatory rural appraisal (PRA) were conducted in all the five villages in order to quantify each of these indicators. A total of 150 households (30 households in each village) were randomly selected across the villages for the household questionnaire survey.
Data analysis methods reported?	Yes	Based on the data obtained from the household survey and the PRA, four indices, corresponding to the four sources of vulnerability—biophysical, agricultural, demographic and socio-economic, were computed for all the villages. Data gaps were bridged by using secondary data, where avail- able. Table 4 shows the average biophysical, agricultural, demographic and socio- economic vulnerability indices for these villages. Following the calculation of the indices, they were assigned weights based on the ranks given to the sources of vulnerability by the farmers themselves during the PRA. A rank of 4 indicates very high contribution to vulnerability, respectively. The final weight to be apportioned was cal- culated by the following formula: Average of the ranks assigned in the five villages Sumof the ranks Table 5 shows the weights apportioned to the average vulnerability indices for calculatingvillage-

levelvulnerability.		
After weights were assigned to the biophysical, agri-		
cultural, socio-economic and demographic indices, a		
composite vulnerability index, representative of the		
climate variability-induced drought vulnerability of the		
resident farmers, was calculated (as per Patnaik and		
Narayanan 2009). The weighted biophysical, agricultural		
and socio- economic vulnerability indices of the villages		
were calcu- lated by multiplying the apportioned weight		
by the average index calculated for each source of		
vulnerability.		
[]		
The composite vulnerability indices for each of the		
villages were calculated using the following formula: V ¼		
hi1=4 4		
Pn i¼1 ðAverage indexi 🛛 WeightiÞ		

Transparency Assessment Article s	ummary
Article	Luers et al (2003)
Transparent operationalizations	Adaptive capacity; exposure; sensitivity; State of system relative to threshold of damage; threshold of damage; Well-being
Partially transparent	
Not transparent	

Structured summary of operationalization – validity assessment Construct: Adaptive capacity Article: Luers et al (2003)			1.1 DCM Appropriate	1.2 valid empirical rep?	1. conclusion - Valid?	2. Feasible?							
							<u>Criterion</u>	Assessment	Quoted text or Rationale for negative assessment				
							Construct defined?	Yes	We define adaptive capacityas the extent to which a system can modify its circumstances to move to a less vulnerable condition (Fig. 1c). We quantifyadaptive capacity(A) as the difference in the vulnerabilityunder existing conditions and under the less vulnerable condition to which the system could potentially shift: A ¼ Vðexisting conditionsÞ [®] Vðmodified conditionsÞ:	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell NO	Yes/ no/ can't tell
Data collection methods reported?	Yes (2ndary data)	To illustrate an application of the proposed metric, we utilize remotely sensed estimates of yields in the Yaqui Valley for four years: 1994, 2000, 2001, and 2002. Yield estimates are derived from Landsat TM and ETM+ data, as described in detail by Lobell et al. (2003). [] For each of the four years, we compute the distribution of yield within the entire Valley, and then rank yields by percentile for each year. We then use a linear least- squares regression of yield with average night-time temperature for January–April to define the average yield and sensitivity for each percentile.	CAN'T TELL										
Reporting of indicators/questions used to operationalise construct?	Yes (2ndary data)	To illustrate an application of the proposed metric, we utilize remotely sensed estimates of yields in the Yaqui Valley for four years: 1994, 2000, 2001, and 2002. Yield estimates are derived from Landsat TM and ETM+ data, as described in detail by Lobell et al. (2003).		NO									

		[] For each of the four years, we compute the distribution of yield within the entire Valley, and then rank yields by	
		percentile for each year. We then use a linear least- squares regression of yield with average night-time	
		temperature for January–April to define the average yield and sensitivity for each percentile.	
Sampling strategies reported?	Yes (2ndary data)	To illustrate an application of the proposed metric, we utilize remotely sensed estimates of yields in the Yaqui Valley for four years: 1994, 2000, 2001, and 2002. Yield estimates are derived from Landsat TM and ETM+ data, as described in detail by Lobell et al. (2003).	
		[] For each of the four years, we compute the distribution of yield within the entire Valley, and then rank yields by percentile for each year. We then use a linear least- squares regression of yield with average night-time	
		temperature for January–April to define the average yield and sensitivity for each percentile.	
Sampling sizes reported?	Yes (2ndary data)	To illustrate an application of the proposed metric, we utilize remotely sensed estimates of yields in the Yaqui Valley for four years: 1994, 2000, 2001, and 2002. Yield estimates are derived from Landsat TM and ETM+ data, as described in detail by Lobell et al. (2003). [] For each of the four years, we compute the distribution of yield within the entire Valley, and then rank yields by	
		percentile for each year. We then use a linear least- squares regression of yield with average night-time temperature for January–April to define the average yield and sensitivity for each percentile.	
Data analysis methods reported?	Yes/no	For each of the four years, we compute the distribu- tion of yield within the entire Valley, and then rank yields by percentile for each year. We then use a linear least- squares regression of yield with average night-time temperature for January–April to define the average yield and sensitivity for each percentile. To define the vulnerabilitycorresponding to each percentile, we run a	

Monte Carlo simulation where temperature varies		
according to a normal distribution with mean equal to		
9.61 [®] C and standard deviation equal to 0.99 [®] C, as		
determined from 20 years of historical climate records.		
We then calculate the vulnerabilityaccording to Eq. (2)		
using a threshold value of 4 t/ha, which is the		
approximate minimum yield required for farmer's to		
"break-even" (i.e. zero net profit) based on the average		
management practices (Matson et al. 1998). We normal-		
ize these vulnerabilityvalues bythe average vulner-		
abilitycalculated for the entire Valley.		
V ¼ Expected Value ðsensitivity=state relative to a		
thresholdÞ;		
V ¼ Z jqW=qXj W=W0		
where W0 represents a threshold value of well-being		
below which the system is said to be damaged.		
where PX refers to the probabilityof the occurrence of		
stressor X:		
[]		
Management is the onlyone of these factors that farmers		
can potentiallymanipulate to move to a less vulnerable		
condition. Therefore, in our analysis we estimate adaptive		
capacity from our time series of yields as the extent to		
which a farm unit has exceeded its average management		
percentile over the studyperiod. We assumed that the		
highest relative yield, as represented by the yield		
percentile, could be achieved everyyear with the		
appropriate management. We estimate the adaptive		
capacityas the difference between the		
vulnerabilitycalculated as above and the vulner-		
abilitycalculated for a yield temperature function where		
we assume the expected yield is equal to the maximum		
yield percentiles observed over the four years. To create a		
unitless measure we normalize this difference by the		
average value of the difference calculated for all pixels		
over the Valley:		

A ¼ ðVR mean 🛛 VR maxÞpixel🔅 i ðVR mean 🖾 VR maxÞvalleyave		
; where R refers to the relative yield percentile.		

Structured summary	of operationaliz	zation – validity assessment	1.1 DCM	1.2 valid	1.	2. Feasible?
Construct: Exposure			Appropriate	empirical	conclusion -	
Article: Luers et al (20	03)			rep?	Valid?	
<u>Criterion</u>	<u>Assessment</u>	Quoted text or Rationale for negative assessment				
Construct defined?	Yes	Different communities and ecosystems are exposed to varying magnitudes and frequencies of disturbing forces, often resulting in differential vulnerabilities (IPCC, 2001; Turner et al., 2003a, b). We capture these differences in exposure bycalculating the expected value of the ratio of sensitivityto the state relative to a threshold based on the frequencydistribution of the stressors of concern:	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell NO	Yes/ no/ can't tell
Data collection methods reported?	Yes (2ndary data)	To illustrate an application of the proposed metric, we utilize remotely sensed estimates of yields in the Yaqui Valley for four years: 1994, 2000, 2001, and 2002. Yield estimates are derived from Landsat TM and ETM+ data, as described in detail by Lobell et al. (2003). [] For each of the four years, we compute the distribution of yield within the entire Valley, and then rank yields by percentile for each year. We then use a linear least- squares regression of yield with average night-time temperature for January–April to define the average yield and sensitivity for each percentile.	CAN'T TELL			
Reporting of indicators/questions used to operationalise construct?	Yes (2ndary data)	To illustrate an application of the proposed metric, we utilize remotely sensed estimates of yields in the Yaqui Valley for four years: 1994, 2000, 2001, and 2002. Yield estimates are derived from Landsat TM and ETM+ data, as described in detail by Lobell et al. (2003). [] For each of the four years, we compute the distribution of		NO		

		yield within the entire Valley, and then rank yields by	
		percentile for each year. We then use a linear least-	
		squares regression of yield with average night-time	
		temperature for January–April to define the average yield	
		and sensitivity for each percentile.	
Sampling strategies	Yes (2ndary	To illustrate an application of the proposed metric,	
reported?	data)	we utilize remotely sensed estimates of yields in the	
		Yaqui Valley for four years: 1994, 2000, 2001, and 2002.	
		Yield estimates are derived from Landsat TM and ETM+	
		data, as described in detail by Lobell et al. (2003).	
		[]	
		For each of the four years, we compute the distribution of	
		yield within the entire Valley, and then rank yields by	
		percentile for each year. We then use a linear least-	
		squares regression of yield with average night-time	
		temperature for January–April to define the average yield	
		and sensitivity for each percentile.	
Sampling sizes	Yes (2ndary	To illustrate an application of the proposed metric,	
reported?	data)	we utilize remotely sensed estimates of yields in the	
		Yaqui Valley for four years: 1994, 2000, 2001, and 2002.	
		Yield estimates are derived from Landsat TM and ETM+	
		data, as described in detail by Lobell et al. (2003).	
		[]	
		For each of the four years, we compute the distribution of	
		yield within the entire Valley, and then rank yields by	
		percentile for each year. We then use a linear least-	
		squares regression of yield with average night-time	
		temperature for January–April to define the average yield	
		and sensitivity for each percentile.	
Data analysis	Yes	For each of the four years, we compute the distribu-	
methods reported?		tion of yield within the entire Valley, and then rank yields	
		by percentile for each year. We then use a linear least-	
		squares regression of yield with average night-time	
		temperature for January–April to define the average yield	
		and sensitivity for each percentile. To define the	
		vulnerabilitycorresponding to each percentile, we run a	
		Monte Carlo simulation where temperature varies	
		according to a normal distribution with mean equal to	

9.61IIC and standard deviation equal to 0.99IIC, as determined from 20 years of historical climate records. We then calculate the vulnerabilityaccording to Eq. (2) using a threshold value of 4 t/ha, which is the approximate minimum yield required for farmer's to "break-even" (i.e. zero net profit) based on the average management practices (Matson et al. 1998). We normal- ize these vulnerabilityvalues bythe average vulner- abilitycalculated for the entire Valley. [] V ¼ Expected Value ðsensitivity=state relative to a thresholdÞ; V ¼ Z jqW=qXj W=W0 IV where W0 represents a threshold value of well-being below which the system is said to be damaged. where PX refers to the probabilityof the occurrence of stressor X:		
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Structured summary	of operationaliz	zation – validity assessment	1.1 DCM	1.2 valid	1. conclusion -	2. Feasible?
Construct: Sensitivity			Appropriate	empirical		
Article: Luers et al (20	003)			rep?	Valid?	
<u>Criterion</u>	Assessment	Quoted text or Rationale for negative assessment				
Construct defined?	Yes	In this example, the sensitivity is represented as the absolute value of the derivative of well-being with respect to the stressor, however, other measures of sensitivity could be used, for example the coefficient of variations.	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell NO	Yes/ no/ can't tell
Data collection methods reported?	Yes (2ndary data)	To illustrate an application of the proposed metric, we utilize remotely sensed estimates of yields in the Yaqui Valley for four years: 1994, 2000, 2001, and 2002. Yield estimates are derived from Landsat TM and ETM+ data, as described in detail by Lobell et al. (2003). []	CAN'T TELL			

		For each of the four years, we compute the distribution of	
		yield within the entire Valley, and then rank yields by	
		percentile for each year. We then use a linear least-	
		squares regression of yield with average night-time	
		temperature for January–April to define the average yield	
		and sensitivity for each percentile.	
Reporting of	Yes (2ndary	To illustrate an application of the proposed metric,	NO
indicators/questions	data)	we utilize remotely sensed estimates of yields in the	
used to	,	Yaqui Valley for four years: 1994, 2000, 2001, and 2002.	
operationalise		Yield estimates are derived from Landsat TM and ETM+	
construct?		data, as described in detail by Lobell et al. (2003).	
		[]	
		For each of the four years, we compute the distribution of	
		yield within the entire Valley, and then rank yields by	
		percentile for each year. We then use a linear least-	
		squares regression of yield with average night-time	
		temperature for January–April to define the average yield	
		and sensitivity for each percentile.	
Sampling strategies	Yes (2ndary	To illustrate an application of the proposed metric,	
reported?	data)	we utilize remotely sensed estimates of yields in the	
	-	Yaqui Valley for four years: 1994, 2000, 2001, and 2002.	
		Yield estimates are derived from Landsat TM and ETM+	
		data, as described in detail by Lobell et al. (2003).	
		[]	
		For each of the four years, we compute the distribution of	
		yield within the entire Valley, and then rank yields by	
		percentile for each year. We then use a linear least-	
		squares regression of yield with average night-time	
		temperature for January–April to define the average yield	
		and sensitivity for each percentile.	
Sampling sizes	Yes (2ndary	To illustrate an application of the proposed metric,	
reported?	data)	we utilize remotely sensed estimates of yields in the	
		Yaqui Valley for four years: 1994, 2000, 2001, and 2002.	
		Yield estimates are derived from Landsat TM and ETM+	
		data, as described in detail by Lobell et al. (2003).	
		[]	
		For each of the four years, we compute the distribution of	
		yield within the entire Valley, and then rank yields by	

		percentile for each year. We then use a linear least- squares regression of yield with average night-time temperature for January–April to define the average yield and sensitivity for each percentile.		
Data analysis methods reported?	Yes	For each of the four years, we compute the distribu- tion of yield within the entire Valley, and then rank yields by percentile for each year. We then use a linear least- squares regression of yield with average night-time temperature for January–April to define the average yield and sensitivity for each percentile.		

Structured summary	of operationaliz	zation – validity assessment	1.1 DCM	1.2 valid	1.	2. Feasible?
Construct: State of sy	stem relative to	threshold of damage	Appropriate	empirical	conclusion -	
Article: Luers et al (20	003)			rep?	Valid?	
<u>Criterion</u>	Assessment	Quoted text or Rationale for negative assessment				
Construct defined?	Yes	identifying a threshold of human well- being at which the system is said to be "damaged."	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell
Data collection methods reported?	Yes	Our unit (or system) of analysis is the "farm unit"— that is an agricultural field and the farmer or farmers responsible for the field. For practical purposes, we define our agricultural field as a 30m230m pixel as described below. Of the manyoutcomes of concern to the Valleyfarmer, we focus on wheat yield as our measure of well-being. Wheat yield alone obviously does not fullycapture the well-being of Valleyfarmers, however, we use it here to illustrate the proposed methodology. [] To illustrate an application of the proposed metric, we utilize remotely sensed estimates of yields in the Yaqui Valley for four years: 1994, 2000, 2001, and 2002. Yield estimates are derived from Landsat TM and ETM+ data, as described in detail by Lobell et al. (2003). [] For each of the four years, we compute the distribution of yield within the entire Valley, and then rank yields by	CAN'T TELL		NO	

reported?	data)	we utilize remotely sensed estimates of yields in the		
		Yaqui Valley for four years: 1994, 2000, 2001, and 2002.		
		Yield estimates are derived from Landsat TM and ETM+		
		data, as described in detail by Lobell et al. (2003).		
		[]		
		For each of the four years, we compute the distribution of		
		yield within the entire Valley, and then rank yields by		
		percentile for each year. We then use a linear least-		
		squares regression of yield with average night-time		
		temperature for January–April to define the average yield		
		and sensitivity for each percentile.		
Data analysis	Yes	For each of the four years, we compute the distribu-		
methods reported?		tion of yield within the entire Valley, and then rank yields		
		by percentile for each year. We then use a linear least-		
		squares regression of yield with average night-time		
		temperature for January–April to define the average yield		
		and sensitivity for each percentile.		
		[]		
		We then calculate the vulnerabilityaccording to Eq. (2)		
		using a threshold value of 4 t/ha, which is the		
		approximate minimum yield required for farmer's to		
		"break-even" (i.e. zero net profit) based on the average		
		management practices (Matson et al. 1998).		

Structured summary	Structured summary of operationalization – validity assessment		1.1 DCM	1.2 valid	1.	2. Feasible?
Construct: threshold of	of damage		Appropriate	ppriate empirical conclusion - rep? Valid?		
Article: Luers et al (20	03)					
<u>Criterion</u>	Assessment	Quoted text or Rationale for negative assessment				
Construct defined?	Yes	W0 represents a threshold value of well-being below	Yes/ no/ can't	Yes/ no/	Yes/ no/	Yes/ no/
		which the system is said to be damaged	tell	can't tell	can't tell	can't tell
Data collection	Yes (2ndary	To illustrate an application of the proposed metric,	CAN'T TELL		NO	
methods reported?	data)	we utilize remotely sensed estimates of yields in the				
		Yaqui Valley for four years: 1994, 2000, 2001, and 2002.				
		Yield estimates are derived from Landsat TM and ETM+				
		data, as described in detail by Lobell et al. (2003).				

		[] For each of the four years, we compute the distribution of yield within the entire Valley, and then rank yields by percentile for each year. We then use a linear least- squares regression of yield with average night-time temperature for January–April to define the average yield and sensitivity for each percentile.		
Reporting of indicators/questions used to operationalise construct?	Yes (2ndary data)	To illustrate an application of the proposed metric, we utilize remotely sensed estimates of yields in the Yaqui Valley for four years: 1994, 2000, 2001, and 2002. Yield estimates are derived from Landsat TM and ETM+ data, as described in detail by Lobell et al. (2003). [] For each of the four years, we compute the distribution of yield within the entire Valley, and then rank yields by percentile for each year. We then use a linear least- squares regression of yield with average night-time temperature for January–April to define the average yield and sensitivity for each percentile.	NO	
Sampling strategies reported?	Yes (2ndary data)	To illustrate an application of the proposed metric, we utilize remotely sensed estimates of yields in the Yaqui Valley for four years: 1994, 2000, 2001, and 2002. Yield estimates are derived from Landsat TM and ETM+ data, as described in detail by Lobell et al. (2003). [] For each of the four years, we compute the distribution of yield within the entire Valley, and then rank yields by percentile for each year. We then use a linear least- squares regression of yield with average night-time temperature for January–April to define the average yield and sensitivity for each percentile.		
Sampling sizes reported?	Yes (2ndary data)	To illustrate an application of the proposed metric, we utilize remotely sensed estimates of yields in the Yaqui Valley for four years: 1994, 2000, 2001, and 2002. Yield estimates are derived from Landsat TM and ETM+ data, as described in detail by Lobell et al. (2003). [] For each of the four years, we compute the distribution of		

		yield within the entire Valley, and then rank yields by percentile for each year. We then use a linear least- squares regression of yield with average night-time temperature for January–April to define the average yield and sensitivity for each percentile.		
Data analysis methods reported?	Yes	using a threshold value of 4 t/ha, which is the approximate minimum yield required for farmer's to "break-even" (i.e. zero net profit) based on the average management practices (Matson et al. 1998).		

Structured summary	of operationaliz	ation – validity assessment	1.1 DCM	1.2 valid	1.	2. Feasible?
Construct: Well-being			Appropriate	empirical	conclusion -	
Article: Luers et al (20	03)			rep?	Valid?	
<u>Criterion</u>	Assessment	Quoted text or Rationale for negative assessment				
Construct defined?	Yes	human–environment system where some mea- sure of human well-being (W)	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell
Data collection methods reported?	Yes (2ndary data)	To illustrate an application of the proposed metric, we utilize remotely sensed estimates of yields in the Yaqui Valley for four years: 1994, 2000, 2001, and 2002. Yield estimates are derived from Landsat TM and ETM+ data, as described in detail by Lobell et al. (2003). [] For each of the four years, we compute the distribution of yield within the entire Valley, and then rank yields by percentile for each year. We then use a linear least- squares regression of yield with average night-time temperature for January–April to define the average yield and sensitivity for each percentile.	NO		NO	
Reporting of indicators/questions used to operationalise construct?	Yes	Of the manyoutcomes of concern to the Valleyfarmer, we focus on wheat yield as our measure of well-being. Wheat yield alone obviously does not fullycapture the well-being of Valleyfarmers, however, we use it here to illustrate the proposed methodology.		NO		
Sampling strategies reported?	Yes (2ndary data)	To illustrate an application of the proposed metric, we utilize remotely sensed estimates of yields in the				

		Yaqui Valley for four years: 1994, 2000, 2001, and 2002. Yield estimates are derived from Landsat TM and ETM+ data, as described in detail by Lobell et al. (2003). [] For each of the four years, we compute the distribution of yield within the entire Valley, and then rank yields by percentile for each year. We then use a linear least- squares regression of yield with average night-time temperature for January–April to define the average yield and sensitivity for each percentile.		
Sampling sizes reported?	Yes (2ndary data)	To illustrate an application of the proposed metric, we utilize remotely sensed estimates of yields in the Yaqui Valley for four years: 1994, 2000, 2001, and 2002. Yield estimates are derived from Landsat TM and ETM+ data, as described in detail by Lobell et al. (2003). [] For each of the four years, we compute the distribution of yield within the entire Valley, and then rank yields by percentile for each year. We then use a linear least- squares regression of yield with average night-time temperature for January–April to define the average yield and sensitivity for each percentile.		
Data analysis methods reported?	Yes	For each of the four years, we compute the distribu- tion of yield within the entire Valley, and then rank yields by percentile for each year.		

Transparency Assessment Article summary			
Article Mengitsu (2011)			
Transparent operationalizations	Perception of Adiha farmers		
Partially transparent			
Not transparent			

Structured summary	of operationaliz	ation – validity assessment	1.1 DCM	1.2 valid	1.	2. Feasible?
Construct: Perception	of Adiha farme	rs	Appropriate empirical conclu		conclusion -	
Article: Mengitsu (201	L1)			rep?	Valid?	l
<u>Criterion</u>	Assessment	Quoted text or Rationale for negative assessment				
Construct defined?	Yes	Adaptation of people to different hazards vary from household to households and region to region based on existing support system to increase the resilience of affected individuals. The assessment was aimed to generate primary information from the farming communities of Adiha related to cli- mate change. This report examined the perception of Adiha farmers on the trend of climate change and re- lated anomalities, existing coping strategies in place.	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell YES	Yes/ no/ can't tell CAN'T TELL
Data collection methods reported?	Yes	2.2.1. Focus Group Discussion (FGD) Focus Group Discussion (FGD) was employed to generate information on the perception of the farmers on climate change, its related hazards, vulnerable groups of the community and existing coping strategies. Six FGDs, each consisting 24 participants, 12 male and 12 women, drawn from different kueshets, were held for climate re- lated hazard identification and characterization, identifi- cation and prioritization of coping mechanisms, identifi- cation and ranking of vulnerable groups and climate and weather forecasting.	YES			
Reporting of indicators/questions used to	Yes	Six FGDs, each consisting 24 participants, 12 male and 12 women, drawn from different kueshets, were held for climate re- lated hazard identification and		YES		

operationalise		characterization, identifi- cation and prioritization of		
construct?		coping mechanisms, identifi- cation and ranking of		
		vulnerable groups and climate and weather forecasting.		
		Tools such as hazard identification and characterization,		
		hazard behavior story telling (time-line), hazard ranking		
		matrix, vulnerability group ranking and experiential		
		stories telling on indigenous technolo- gies and		
		knowledge were used to acquire information on farmers'		
		perception on climate change trends, existing hazards and		
		their severity and vulnerable groups of the community.		
		The different coping strategies used by the community		
		were also identified and analyzed for their effectiveness.		
		Effectiveness was rated as very satisfac- tory, satisfactory		
		and not satisfactory and the rating number converted to		
		percent to assess satisfaction level.		
Sampling strategies	Yes	Respondents were systematically sampled from Adiha		
reported?		tabia populations across all of the kueshets. One hundred		
		forty four (144) respondents were sampled from popula-		
		tion of the tabia. Various factors including gender (male/		
		female headed farm households), age, access to irriga-		
		tion water and land holding size were considered during		
		sampling.		
Sampling sizes	Yes	One hundred forty four (144) respondents were sampled		
reported?		from popula- tion of the tabia.		
Data analysis	Yes	Information was recorded using worksheets prepared		
methods reported?		for each category of discussion. Data collected on each		
		parameter was expressed as percent of respondents.		
		Farmer's perceptions on changes in long-term tempera-		
		ture and precipitation as well as various coping strategies		
		being used by farmers were analyzed and presented us-		
		ing simple descriptive statistics (tables and figures).		

Transparency Assessment Article summary					
Article	Mubaya et al (2012)				
Transparent operationalizations	Climate change; climate change and variability; climate variability; Farmer perceptions; non-climatic stress				
Partially transparent					
Not transparent					

Structured summary	of operationaliz	zation – validity assessment	1.1 DCM	1.2 valid	1.	2. Feasible?
Construct: Climate ch	<mark>ange</mark>		Appropriate	empirical	conclusion -	
Article: Mubaya et al	(2012)		-	rep?	Valid?	
Criterion	Assessment	Quoted text or Rationale for negative assessment				
Construct defined?	Yes	In this paper, the distinction between 'climate variability' and 'climate change' relates to differences in time-scale. On the one hand, 'climate variability' is conceptualised as variations in the climate system over short time scales such as months, years or decades and on the other hand 'climate change' is conceptualised as longer term trends in mean climate variables of periods of decades or longer. This is the suggested distinction in definitions of the concepts in question by the IPCC (2001).	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell NO	Yes/ no/ can't tell
Data collection methods reported?	Yes	The qualitative methods of data collection used include Participatory Rural Appraisal (PRA) techniques such as historical trend analysis and matrix scoring and ranking and Focus Group Discussions (FGDs). The quantitative method used is the household questionnaire survey.	NO			
Reporting of indicators/questions used to operationalise construct?	Yes	2.2.2. Qualitative assessments FGDs were used to first of all establish the general perceptions regarding climate change and variability and their causes and various stressors that confront farmers' livelihoods (see Appendix 2). Following this, it was considered important for this study to factor in how farmers regard climate change and variability as an obstacle to their livelihoods among the multiple stressors that they had		NO		

		identified. Among these stressors are climate variability in		
		different forms, issues of financial capital, issues related		
		to cattle pests and diseases, inadequate draught power,		
		marketing issues and HIV and AIDS. A matrix scoring and		
		ranking exercise was then facilitated for		
		farmers. Farmers were asked as a group to select from		
		the long list of stressors the ones they considered critical		
		for the purposes of scoring and ranking. The second step		
		involved participants defining criteria that they would use		
		to evaluate these stressors. These criteria include food		
		security, income generation, crop production and		
		livelihood security. Through group consensus, farmers		
		then decided how much to allocate each shock out of a		
		total of 20 points, based on the group defined criteria.		
		Historical trend lines were used to elicit information on		
		specific historical trends in farmers' perceptions regarding		
		changes in climate over a period of 20 years and as far		
		back as they could recall. Specifically, participants were		
		asked to recall major occurrences that had a bearing on		
		climate and weather, community resources, and even the		
		political situation. They were then asked to indicate what		
		occurrences had the greatest impact on their livelihoods		
		among the cited events.		
		[]		
		2.2.3. Quantitative assessments The questionnaire survey		
		was used to collect household data		
		and complement data generated through the qualitative		
		methods. This survey collected data on changes in crops		
		grown over a period of five years and reasons for these		
		changes, indicators for good and bad crop production		
		seasons and years considered to be good or bad over a		
		ten year period. Questions in the survey also related to		
		changes in weather patterns over a ten year period in		
		relation to agriculture and what might have caused these		
		changes. General household characteristics were also		
		captured in this survey (see Appendix 1).		
Sampling strategies	Yes	A sample of 720 households across countries was selected		
reported?		for		

		the survey, 180 households per each of the four districts.		
		Specifi- cally, systematic random sampling was employed		
		to come up with six villages per district (making them 24		
		across countries) and 30 households per each of these		
		villages, making a total of 380 households per country		
		(this study was part of a big inter- institutional research-		
		based development project). For FGDs and PRA		
		workshops, a group of eight to 15 participants		
		was selected to represent the three villages per district,		
		with approximately five representatives from each of the		
		three villages per district. In coming up with this group,		
		factors such as age and gender were used. In terms of		
		gender, separate PRA workshops were held for men and		
		women in order not to compromise the amount and		
		quality of information that can be generated from the less		
		confident if they were to be combined. Specifically, old		
		men and women were incorporated into the sample for		
		the group discussions in order to capture information		
		related to historical trends in climate. Itwas envisaged		
		that they would be able to recall as far back as they could		
		and provide rich information on these trends. In the same		
		context, youths were incorporated into the sample in		
		order to validate some of the recent trends on climate		
		suggested by the elderly.		
Sampling sizes	Yes	A sample of 720 households across countries was selected		
reported?		for		
•		the survey, 180 households per each of the four districts.		
		[]		
		For FGDs and PRA workshops, a group of eight to 15		
		participants		
		was selected to represent the three villages per district,		
		I with approximately five representatives from each of the		
		with approximately five representatives from each of the three villages per district.		
Data analysis	Yes	three villages per district.	 	
Data analysis methods reported?	Yes			
Data analysis methods reported?	Yes	three villages per district.Qualitative data were categorised and analysed in four distinct themes. These themes are		
•	Yes	three villages per district.Qualitative data were categorised and analysed in four		

farmers and Perceptions regarding climate ch relation to other stressors.	ange in
These perceptions were established in historic lines,	cal trend
FGDs and matrix scoring and ranking and they	
presented in this manner in the sections unde and discussion.	er results
[]	and into the
Data from the questionnaire survey were enter Statistical Package for the Social Sciences (SPS	
analysed by running descriptive frequencies ir the distinct themes highlighted in this section	
themes include perceptions regarding change	is in weather
patterns in general and for specific seasons ar causes of these changes. These frequencies w	
disaggregated by district and country.	

Structured summary	Structured summary of operationalization – validity assessment		1.1 DCM	1.2 valid	1.	2. Feasible?
Construct: Climate ch	Construct: Climate change and variability		Appropriate	empirical	conclusion -	
Article: Mubaya et al (2012)			rep?	Valid?		
<u>Criterion</u>	Assessment	Quoted text or Rationale for negative assessment				
Construct defined?	Yes	In this paper, the distinction between 'climate variability' and 'climate change' relates to differences in time-scale. On the one hand, 'climate variability' is conceptualised as variations in the climate system over short time scales such as months, years or decades and on the other hand 'climate change' is conceptualised as longer term trends in mean climate variables of periods of decades or longer. This is the suggested distinction in definitions of the concepts in question by the IPCC (2001).	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell NO	Yes/ no/ can't tell
Data collection methods reported?	Yes	The qualitative methods of data collection used include Participatory Rural Appraisal (PRA) techniques such as historical trend analysis and matrix scoring and ranking and Focus Group Discussions (FGDs). The quantitative method used is the household questionnaire survey.	NO			

Reporting of	Yes	2.2.2. Qualitative assessments FGDs were used to first of	NO		
indicators/questions	100	all establish the general perceptions			
used to		regarding climate change and variability and their causes			
operationalise		and various stressors that confront farmers' livelihoods			
construct?		(see Appendix 2). Following this, it was considered			
construct.		important for this study to factor in how farmers regard			
		climate change and variability as an obstacle to their			
		livelihoods among the multiple stressors that they had			
		identified. Among these stressors are climate variability in			
		different forms, issues of financial capital, issues related			
		to cattle pests and diseases, inadequate draught power,			
		marketing issues and HIV and AIDS. A matrix scoring and			
		ranking exercise was then facilitated for			
		farmers. Farmers were asked as a group to select from			
		the long list of stressors the ones they considered critical			
		for the purposes of scoring and ranking. The second step			
		involved participants defining criteria that they would use			
		to evaluate these stressors. These criteria include food			
		security, income generation, crop production and			
		livelihood security. Through group consensus, farmers			
		then decided how much to allocate each shock out of a			
		total of 20 points, based on the group defined criteria.			
		Historical trend lines were used to elicit information on			
		specific historical trends in farmers' perceptions regarding			
		changes in climate over a period of 20 years and as far			
		back as they could recall. Specifically, participants were			
		asked to recall major occurrences that had a bearing on			
		climate and weather, community resources, and even the			
		political situation. They were then asked to indicate what			
		occurrences had the greatest impact on their livelihoods			
		among the cited events.			
		[]			
		2.2.3. Quantitative assessments The questionnaire survey			
		was used to collect household data			
		and complement data generated through the qualitative			
		methods. This survey collected data on changes in crops			
		grown over a period of five years and reasons for these			
		changes, indicators for good and bad crop production			
	1			1	1

T					1
	changes. General household characteristics were also				
	captured in this survey (see Appendix 1).				
Yes	A sample of 720 households across countries was selected				
	for				
	the survey, 180 households per each of the four districts.				
	Specifi- cally, systematic random sampling was employed				
	to come up with six villages per district (making them 24				
	across countries) and 30 households per each of these				
	villages, making a total of 380 households per country				
	(this study was part of a big inter- institutional research-				
	based development project). For FGDs and PRA				
	workshops, a group of eight to 15 participants				
	was selected to represent the three villages per district,				
	•				
	5				
	order to validate some of the recent trends on climate				
Yes					
	for				
	participants				
		YesA sample of 720 households across countries was selected for the survey, 180 households per each of the four districts. Specifi- cally, systematic random sampling was employed to come up with six villages per district (making them 24 across countries) and 30 households per each of these villages, making a total of 380 households per country (this study was part of a big inter- institutional research- based development project). For FGDs and PRA workshops, a group of eight to 15 participants was selected to represent the three villages per district, with approximately five representatives from each of the three villages per district. In coming up with this group, factors such as age and gender were used. In terms of gender, separate PRA workshops were held for men and women in order not to compromise the amount and quality of information that can be generated from the less confident if they were to be combined. Specifically, old men and women were incorporated into the sample for the group discussions in order to capture information related to historical trends in climate. Itwas envisaged that they would be able to recall as far back as they could and provide rich information on these trends. In the same context, youths were incorporated into the sample in order to validate some of the recent trends on climate suggested by the elderly.YesA sample of 720 households across countries was selected for the survey, 180 households per each of the four districts. [] For FGDs and PRA workshops, a group of eight to 15	ten year period. Questions in the survey also related to changes in weather patterns over a ten year period in relation to agriculture and what might have caused these changes. General household characteristics were also captured in this survey (see Appendix 1).YesA sample of 720 households across countries was selected for the survey, 180 households per each of the four districts. Specifi- cally, systematic random sampling was employed to come up with six villages per district (making them 24 across countries) and 30 households per each of these villages, making a total of 380 households per country (this study was part of a big inter- institutional research- based development project). For FGDs and PRA workshops, a group of eight to 15 participants was selected to represent the three villages per district, with approximately five representatives from each of the three villages per district. In coming up with this group, factors such as age and gender were used. In terms of gender, separate PRA workshops were held for men and women in order not to compromise the amount and quality of information that can be generated from the less confident if they were to be combined. Specifically, old men and women were incorporated into the sample for the group discussions in order to capture information related to historical trends in climate. Itwas envisaged that they would be able to recall as far back as they could and provide rich information on these trends. In the same context, youths were incorporated into the sample in order to validate some of the recent trends on climate suggested by the elderly.YesA sample of 720 households per each of the four districts. [] For FGDs and PRA workshops, a group of eight to 15	ten year period. Questions in the survey also related to changes in weather patterns over a ten year period in relation to agriculture and what might have caused these changes. General household characteristics were also captured in this survey (see Appendix 1).YesA sample of 720 households across countries was selected for the survey, 180 households per each of the four districts. Specifi-cally, systematic random sampling was employed to come up with six vilages per district (making them 24 across countries) and 30 households per each of these vilages, making a total of 380 households per country (this study was part of a big inter-institutional research- based development project). For FGDs and PRA workshops, a group of eight to 15 participants was selected to represent the three vilages per district, with approximately five representatives from each of the three villages per district. In coming up with this group, factors such as age and gender were used. In terms of gender, separate PRA workshops were held for men and women in order not to compromise the amount and quality of information that can be generated from the less confident if they were to be combined. Specifically, old men and women were incorporated into the sample for the group discussions in order to capture information related to historical trends in climate. Itwas envisaged that they would be able to recall as far back as they could and provide rich information on these trends. In the same context, youths were incorporated into the sample in order to validate some of the recent trends on climate suggested by the elderly.YesA sample of 720 households per each of the four districts. [] For FGDs and PRA workshops, a group of eight to 15	ten year period. Questions in the survey also related to changes in weather patterns over a ten year period in relation to agriculture and what might have caused these changes. General household characteristics were also captured in this survey (see Appendix 1).YesA sample of 720 households per each of the four districts. Specifi- cally, systematic random sampling was employed to come up with six villages per district (making them 24 across countries) and 30 households per each of these villages, making a total of 380 households per each of these villages, making a total of 380 households per each of these villages, making a total of 380 households per each of these villages, making a total of 380 households per each of these villages, making a total of 380 households per each of these villages, making a total of a big inter- institutional research- based development project). For FGDs and PRA workshops, a group of eight to 15 participants was selected to represent the three villages per district, with approximately five representatives from each of the three villages per district. In coming up with this group, factors such as age and gender were used. 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		was selected to represent the three villages per district,	
		with approximately five representatives from each of the	
	1	three villages per district.	
Data analysis	Yes	Qualitative data were categorised and analysed in four	L
methods reported?		distinct themes. These themes are	L
		Perceptions regarding changes in weather patterns,	
		Perceptions regarding causes of changes and variability in	
		climate, Perceptions regarding other stressors among	
		farmers and Perceptions regarding climate change in	
		relation to other stressors.	
		These perceptions were established in historical trend	L
		lines,	
		FGDs and matrix scoring and ranking and they are	
		presented in this manner in the sections under results	l
		and discussion.	l
		[]	
		Data from the questionnaire survey were entered into the	L
		Statistical Package for the Social Sciences (SPSS) and	
		analysed by running descriptive frequencies in relation to	
		the distinct themes highlighted in this section. These	
		themes include perceptions regarding changes in weather	
		patterns in general and for specific seasons and regarding	
		causes of these changes. These frequencies were	
		disaggregated by district and country.	

Structured summary of operationalization – validity assessment			1.1 DCM	1.2 valid	1.	2. Feasible?
Construct: Climate va	Construct: Climate variability			empirical	conclusion -	
Article: Mubaya et al	Article: Mubaya et al (2012)			rep?	Valid?	
<u>Criterion</u>	<u>Assessment</u>	Quoted text or Rationale for negative assessment				
Construct defined?	Yes	In this paper, the distinction between 'climate variability' and 'climate change' relates to differences in time-scale. On the one hand, 'climate variability' is conceptualised as variations in the climate system over short time scales such as months, years or decades and on the other hand 'climate change' is conceptualised as longer term trends	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell NO	Yes/ no/ can't tell

		in mean climate variables of periods of decades or longer.		
		This is the suggested distinction in definitions of the		
		concepts in question by the IPCC (2001).		
Data collection	Yes	The gualitative methods of data collection used include	NO	
methods reported?		Participatory Rural Appraisal (PRA) techniques such as	-	
		historical trend analysis and matrix scoring and ranking		
		and Focus Group Discussions (FGDs). The quantitative		
		method used is the household questionnaire survey.		
Reporting of	Yes	2.2.2. Qualitative assessments FGDs were used to first of		NO
indicators/questions		all establish the general perceptions		
used to		regarding climate change and variability and their causes		
operationalise		and various stressors that confront farmers' livelihoods		
construct?		(see Appendix 2). Following this, it was considered		
		important for this study to factor in how farmers regard		
		climate change and variability as an obstacle to their		
		livelihoods among the multiple stressors that they had		
		identified. Among these stressors are climate variability in		
		different forms, issues of financial capital, issues related		
		to cattle pests and diseases, inadequate draught power,		
		marketing issues and HIV and AIDS. A matrix scoring and		
		ranking exercise was then facilitated for		
		farmers. Farmers were asked as a group to select from		
		the long list of stressors the ones they considered critical		
		for the purposes of scoring and ranking. The second step		
		involved participants defining criteria that they would use		
		to evaluate these stressors. These criteria include food		
		security, income generation, crop production and		
		livelihood security. Through group consensus, farmers		
		then decided how much to allocate each shock out of a		
		total of 20 points, based on the group defined criteria.		
		Historical trend lines were used to elicit information on		
		specific historical trends in farmers' perceptions regarding		
		changes in climate over a period of 20 years and as far		
		back as they could recall. Specifically, participants were		
		asked to recall major occurrences that had a bearing on		
		climate and weather, community resources, and even the		
		political situation. They were then asked to indicate what		
		occurrences had the greatest impact on their livelihoods		

		among the cited events.		1
				1
		[]		
		2.2.3. Quantitative assessments The questionnaire survey		
		was used to collect household data		
		and complement data generated through the qualitative		
		methods. This survey collected data on changes in crops		
		grown over a period of five years and reasons for these		
		changes, indicators for good and bad crop production		
		seasons and years considered to be good or bad over a		
		ten year period. Questions in the survey also related to		
		changes in weather patterns over a ten year period in		
		relation to agriculture and what might have caused these		
		changes. General household characteristics were also		
		captured in this survey (see Appendix 1).		
Sampling strategies	Yes	A sample of 720 households across countries was selected		
reported?		for		
		the survey, 180 households per each of the four districts.		
		Specifi- cally, systematic random sampling was employed		
		to come up with six villages per district (making them 24		
		across countries) and 30 households per each of these		
		villages, making a total of 380 households per country		
		(this study was part of a big inter- institutional research-		
		based development project). For FGDs and PRA		
		workshops, a group of eight to 15 participants		
		was selected to represent the three villages per district,		
		with approximately five representatives from each of the		
		three villages per district. In coming up with this group,		
		factors such as age and gender were used. In terms of		
		gender, separate PRA workshops were held for men and		
		women in order not to compromise the amount and		
		quality of information that can be generated from the less		
		confident if they were to be combined. Specifically, old		
		men and women were incorporated into the sample for		
		the group discussions in order to capture information		
		related to historical trends in climate. Itwas envisaged		
		that they would be able to recall as far back as they could		
		and provide rich information on these trends. In the same		
		context, youths were incorporated into the sample in		
		Specifi- cally, systematic random sampling was employed to come up with six villages per district (making them 24 across countries) and 30 households per each of these villages, making a total of 380 households per country (this study was part of a big inter- institutional research- based development project). For FGDs and PRA workshops, a group of eight to 15 participants was selected to represent the three villages per district, with approximately five representatives from each of the three villages per district. In coming up with this group, factors such as age and gender were used. In terms of gender, separate PRA workshops were held for men and women in order not to compromise the amount and quality of information that can be generated from the less confident if they were to be combined. Specifically, old men and women were incorporated into the sample for the group discussions in order to capture information related to historical trends in climate. Itwas envisaged that they would be able to recall as far back as they could and provide rich information on these trends. In the same		

		order to validate some of the recent trends on climate		
		suggested by the elderly.		
Sampling sizes	Yes	A sample of 720 households across countries was selected		
reported?		for		
		the survey, 180 households per each of the four districts.		
		[]		
		For FGDs and PRA workshops, a group of eight to 15		
		participants		
		was selected to represent the three villages per district,		
		with approximately five representatives from each of the		
		three villages per district.		
Data analysis	Yes	Qualitative data were categorised and analysed in four		
methods reported?		distinct themes. These themes are		
		Perceptions regarding changes in weather patterns,		
		Perceptions regarding causes of changes and variability in		
		climate, Perceptions regarding other stressors among		l
		farmers and Perceptions regarding climate change in		
		relation to other stressors.		
		These perceptions were established in historical trend		
		lines,		
		FGDs and matrix scoring and ranking and they are presented in this manner in the sections under results		
		and discussion.		
		Data from the questionnaire survey were entered into the		
		Statistical Package for the Social Sciences (SPSS) and		
		analysed by running descriptive frequencies in relation to		
		the distinct themes highlighted in this section. These		
		themes include perceptions regarding changes in weather		
		patterns in general and for specific seasons and regarding		
		causes of these changes. These frequencies were		
		disaggregated by district and country.		

Structured summary of operationalization – validity assessment	1.1 DCM	1.2 valid	1.	2. Feasible?
Construct: Farmer perceptions	Appropriate	empirical	conclusion -	

Article: Mubaya et al	Article: Mubaya et al (2012)			rep?	Valid?	
Criterion	Assessment	Quoted text or Rationale for negative assessment				
Construct defined?	Yes	there is an alternative approach which underscores how individuals perceive their environment and make decisions, with mal-adaptations attributed to problems in perception, cognition or the lack of available information (Diggs, 1991; Saarinen, 1966; Taylor et al., 1988). The main point is that from whatever level these adapta- tion measures are taken, the adaptation and coping measures depend on households' perceptions of extreme events and the problems associated with them (Davies, 1993).	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell YES	Yes/ no/ can't tell
Data collection methods reported?	Yes	The qualitative methods of data collection used include Participatory Rural Appraisal (PRA) techniques such as historical trend analysis and matrix scoring and ranking and Focus Group Discussions (FGDs). The quantitative method used is the household questionnaire survey.	YES			
Reporting of indicators/questions used to operationalise construct?	Yes	2.2.2. Qualitative assessments FGDs were used to first of all establish the general perceptions regarding climate change and variability and their causes and various stressors that confront farmers' livelihoods (see Appendix 2). Following this, it was considered important for this study to factor in how farmers regard climate change and variability as an obstacle to their livelihoods among the multiple stressors that they had identified. Among these stressors are climate variability in different forms, issues of financial capital, issues related to cattle pests and diseases, inadequate draught power, marketing issues and HIV and AIDS. A matrix scoring and ranking exercise was then facilitated for farmers. Farmers were asked as a group to select from the long list of stressors the ones they considered critical for the purposes of scoring and ranking. The second step involved participants defining criteria that they would use to evaluate these stressors. These criteria include food security, income generation, crop production and livelihood security. Through group consensus, farmers then decided how much to allocate each shock out of a total of 20 points, based on the group defined criteria.		YES		

		Historical trend lines were used to elicit information on		
		specific historical trends in farmers' perceptions regarding		
		changes in climate over a period of 20 years and as far		
		back as they could recall. Specifically, participants were		
		asked to recall major occurrences that had a bearing on		
		climate and weather, community resources, and even the		
		political situation. They were then asked to indicate what		
		occurrences had the greatest impact on their livelihoods		
		among the cited events.		
		[]		
		2.2.3. Quantitative assessments The questionnaire survey		
		was used to collect household data		
		and complement data generated through the qualitative		
		methods. This survey collected data on changes in crops		
		grown over a period of five years and reasons for these		
		changes, indicators for good and bad crop production		
		seasons and years considered to be good or bad over a		
		ten year period. Questions in the survey also related to		
		changes in weather patterns over a ten year period in		
		relation to agriculture and what might have caused these		
		changes. General household characteristics were also		
		captured in this survey (see Appendix 1).		
Sampling strategies	Yes	A sample of 720 households across countries was selected		
reported?		for		
		the survey, 180 households per each of the four districts.		
		Specifi- cally, systematic random sampling was employed		
		to come up with six villages per district (making them 24		
		across countries) and 30 households per each of these		
		villages, making a total of 380 households per country		
		(this study was part of a big inter- institutional research-		
		based development project). For FGDs and PRA		
		workshops, a group of eight to 15 participants		
		was selected to represent the three villages per district,		
		with approximately five representatives from each of the		
		three villages per district. In coming up with this group,		
		factors such as age and gender were used. In terms of		
		gender, separate PRA workshops were held for men and		
	1	women in order not to compromise the amount and		

		quality of information that can be generated from the less		
		confident if they were to be combined. Specifically, old		
		men and women were incorporated into the sample for		
		the group discussions in order to capture information		
		related to historical trends in climate. Itwas envisaged		
		that they would be able to recall as far back as they could		
		and provide rich information on these trends. In the same		
		context, youths were incorporated into the sample in		
		order to validate some of the recent trends on climate		
		suggested by the elderly.		
Sampling sizes	Yes	A sample of 720 households across countries was selected		
reported?		for		
		the survey, 180 households per each of the four districts.		
		[]		
		For FGDs and PRA workshops, a group of eight to 15		
		participants		
		was selected to represent the three villages per district,		
		with approximately five representatives from each of the		
		three villages per district.		
Data analysis	Yes	Qualitative data were categorised and analysed in four		
methods reported?		distinct themes. These themes are		
		Perceptions regarding changes in weather patterns,		
		Perceptions regarding causes of changes and variability in		
		climate, Perceptions regarding other stressors among		
		farmers and Perceptions regarding climate change in		
		relation to other stressors.		
		These perceptions were established in historical trend		
		lines,		
		FGDs and matrix scoring and ranking and they are		
		presented in this manner in the sections under results		
		and discussion.		
		[]		
		Data from the questionnaire survey were entered into the		
		Statistical Package for the Social Sciences (SPSS) and		
		Statistical Package for the Social Sciences (SPSS) and analysed by running descriptive frequencies in relation to		
		Statistical Package for the Social Sciences (SPSS) and		

causes of these changes. These frequencies were		
disaggregated by district and country.		

			1.1 DCM	1.2 valid	1.	2. Feasible?
Construct: Non-climatic stress			Appropriate	empirical	conclusion -	
Article: Mubaya et al		rep?	Valid?			
<u>Criterion</u>	<u>Assessment</u>	Quoted text or Rationale for negative assessment				
Construct defined?	Yes	It is important to note though, that climate change amplifies already existing risks for farmers. This is the case as there are non- climatic risk factors such as economic instability, trade liberalisa- tion, conflicts and poor governance that may also be faced by farmers (Nyong and Niang-Diop, 2006). Other factors are impacts of diseases such as malaria and HIV and AIDS and lack of and limited access to climate and agricultural information (Gandure, 2005; Gandure and Marongwe, 2006). Africa is also characterised by institutional and legal frameworks that are, in some cases, insuffi- cient to deal with environmental degradation and disaster risks (Beg et al., 2002; Sokona and Denton, 2001).	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell YES	Yes/ no/ can't tell
Data collection methods reported?	Yes	The qualitative methods of data collection used include Participatory Rural Appraisal (PRA) techniques such as historical trend analysis and matrix scoring and ranking and Focus Group Discussions (FGDs). The quantitative method used is the household questionnaire survey.	YES			
Reporting of indicators/questions used to operationalise construct?	Yes	2.2.2. Qualitative assessments FGDs were used to first of all establish the general perceptions regarding climate change and variability and their causes and various stressors that confront farmers' livelihoods (see Appendix 2). Following this, it was considered important for this study to factor in how farmers regard climate change and variability as an obstacle to their livelihoods among the multiple stressors that they had identified. Among these stressors are climate variability in		YES		

Sampling strategies Yes A sample of the survey (see Appendix 1).					
Sampling strategiesYesYesA sample of yato provide yato subject of yato provide yato yato yato yato yato yato yato yato					
Sampling strategies Yes A sample of 720 households across countries was selected					
bit the long list of stressors the ones they considered critical for the purposes of scoring and ranking. The second step involved participants defining criteria that they would use to evaluate these stressors. These criteria include food security, income generation, crop production and livelihood security. Through group consensus, farmers then decided how much to allocate each shock out of a total of 20 points, based on the group defined criteria. Historical trend lines were used to elicit information on specific historical trend lines were used to elicit information on specific historical trends in farmers' perceptions regarding changes in climate over a period of 20 years and as far back as they could recall. Specifically, participants were asked to recall major occurrences that had a bearing on climate and weather, community resources, and even the political situation. They were then asked to indicate what occurrences had the greatest impact on their livelihoods among the cited events. []2.2.3. Quantitative assessments The questionnaire survey was used to collect household dat and complement data generated through the qualitative methods. This survey collected data on changes in or these changes, indicators for good and bad crop production seasons and years considered to be good or bad over a ten year period. Questions in the survey also related to changes. General household characteristics were also captured in this survey (see Appendix 1).Sampling strategies forYesA sample of 720 households across countries was selected for			ranking exercise was then facilitated for		
for the purposes of scoring and ranking. The second step involved participants defining criteria that they would use to evaluate these stressors. These criteria include food security. income generation, crop production and livelihood security. Through group consensus, farmers then decided how much to allocate each shock out of a total of 20 points, based on the group defined criteria. Historical trend lines were used to elicit information on specific historical trend line veral. Specifically, participants were asked to recall major occurrences that had a bearing on climate and weather, community resources, and even the political situation. They were then asked to indicate what occurrences had the greatest impact on their livelihoods among the cited events. []2.2.3. Quantitative assessments The questionnaire survey was used to collect household data and complement data generated through the qualitative methods. This survey collected data on changes in crops grown over a period of five years and lease of the survey also assessments the survey also related to changes in relation to agriculture and what might have caused those hold data and complement data generated through the qualitative methods. This survey (see Appendix 1).Sampling strategies reported?YesA sample of 720 households across countries was selected for			farmers. Farmers were asked as a group to select from		
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Sampling strategies Yes A sample of 720 households across countries was selected reported? for			changes. General household characteristics were also		
reported? for			captured in this survey (see Appendix 1).		
	Sampling strategies	Yes	A sample of 720 households across countries was selected		
the survey, 180 households per each of the four districts.	reported?		for		
			the survey, 180 households per each of the four districts.		

	1		 	
		Specifi- cally, systematic random sampling was employed		
		to come up with six villages per district (making them 24		
		across countries) and 30 households per each of these		
		villages, making a total of 380 households per country		
		(this study was part of a big inter- institutional research-		
		based development project). For FGDs and PRA		
		workshops, a group of eight to 15 participants		
		was selected to represent the three villages per district,		
		with approximately five representatives from each of the		
		three villages per district. In coming up with this group,		
		factors such as age and gender were used. In terms of		
		gender, separate PRA workshops were held for men and		
		women in order not to compromise the amount and		
		quality of information that can be generated from the less		
		confident if they were to be combined. Specifically, old		
		men and women were incorporated into the sample for		
		the group discussions in order to capture information		
		related to historical trends in climate. Itwas envisaged		
		that they would be able to recall as far back as they could		
		and provide rich information on these trends. In the same		
		context, youths were incorporated into the sample in		
		order to validate some of the recent trends on climate		
		suggested by the elderly.		
Sampling sizes	Yes	A sample of 720 households across countries was selected		
reported?		for		
		the survey, 180 households per each of the four districts.		
		[]		
		For FGDs and PRA workshops, a group of eight to 15		
		participants		
		was selected to represent the three villages per district,		
		with approximately five representatives from each of the		
		three villages per district.		
Data analysis	Yes	Qualitative data were categorised and analysed in four		
methods reported?		distinct themes. These themes are		
		Perceptions regarding changes in weather patterns,		
		Perceptions regarding causes of changes and variability in		
		climate, Perceptions regarding other stressors among		
		farmers and Perceptions regarding climate change in		

relation to other stressors.		
These perceptions were established in historical trend		
lines,		
FGDs and matrix scoring and ranking and they are		
presented in this manner in the sections under results		
and discussion.		
[]		
Data from the questionnaire survey were entered into the		
Statistical Package for the Social Sciences (SPSS) and		
analysed by running descriptive frequencies in relation to		
the distinct themes highlighted in this section. These		
themes include perceptions regarding changes in weather		
patterns in general and for specific seasons and regarding		
causes of these changes. These frequencies were		
disaggregated by district and country.		

Transparency Assessment Article summary						
Article	Mutsvangwa (2011)					
Transparent operationalizations	Cereal production; vulnerability threshold					
Partially transparent						
Not transparent						

		1.1 DCM	1.2 valid	1.	2. Feasible?	
Construct: Cereal Production			Appropriate	empirical	conclusion -	
Article: Mutsvangwa	(2011)			rep?	Valid?	
<u>Criterion</u>	<u>Assessment</u>	Quoted text or Rationale for negative assessment				
Construct defined?	Yes	Smallholder farmers in Zimbabwe commonly produce cereals such as maize, millet and sorghum; with maize being the staple food and most commonly grown cereal. The energy content of the three cereals is almost the same, with maize, millet and sorghum producing 358, 329 and 336 kilocalories per 100g of grain respectively (Leder, 2010). In this study maize, sorghum and millet produced by the household is added so as to determine how much per capita cereal is produced by the household. [] In addition the Southern Africa Regional Poverty Network's (2003) report on the regional overview of the southern African food security crisis suggests that an average family of 6 people requires about 800 -1000kg annually of cereal to be food secure, which also suggests a per capita cereal requirement of approximately 165kg.	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell YES	Yes/ no/ can't tell YES
Data collection methods reported?	Yes	The primary data used in this study was obtained from a survey carried out in September 2009. The survey gathered qualitative and quantitative data pertaining to social, demographic and economic aspects of the households, agriculture activities, farmers' perceptions of	YES			

		_	and the role of local organizations in	
			der farmers develop strategies to the negative climate change.	
Reporting of indicators/questions used to operationalise construct?	Yes	Data on product and asset owner	ion/acquisition of cereals, household size ship was gathered, as summarized in a was gathered using the household	YES
		Type of data	Specific data collected	
		Agriculture production	Arable land owned; crops grown and areas allocated to the crops; yields obtained; farming implements available; availability of draft power; livestock owned; crop management practices	
Sampling strategies reported?	Yes	level. The aim w terms of the clin inhabitants of su going to be affec [] The selection for meet the object	sites was done at the BACCC project as to select areas that are marginal in nate experienced so as to assess how uch communities are being affected or are cted by climate change. In the study sites was done strategically to ives of the project and one of the main o look at smallholder farmers in marginal	
Sampling sizes reported?	Yes	The sampling pro district, two war households fron were selected fr per ward and 15	ocedure involved selecting from each ds; three villages from each ward; and 15 n each village. A total of 180 households om the two districts, 90 per district, 45 households in each village. The study sites is also summarized in Table	
Data analysis methods reported?	Yes	descriptive statis crosstabs. [] The other analys	a was then analyzed by running stics; mainly frequencies, descriptive and ses carried out involved running the 2 res regression model using SPSS to find	

was given by:

Structured summary	of operationaliz	zation – validity assessment	1.1 DCM	1.2 valid	1.	2. Feasible?
Construct: Vulnerabili	ty threshold		Appropriate	empirical	conclusion -	
Article: Mutsvangwa (2011)			rep?	Valid?	
<u>Criterion</u>	<u>Assessment</u>	Quoted text or Rationale for negative assessment				
Construct defined?	Yes	The choice of the vulnerability threshold involves	Yes/ no/ can't	Yes/ no/	Yes/ no/	Yes/ no/
		generating a sample that is classified into two groups,	tell	can't tell	can't tell	can't tell
		that is those that are vulnerable and those that are not			CAN'T TELL	
		vulnerable to food insecurity. It entails establishing a				
		vulnerability threshold, such that a household is said to be				
		vulnerable if its vulnerability probability is greater or				
		equal to v, i.e. vh ≥ v.				
Data collection	n/a	This is a threshold construct. Therefore it is	CAN'T TELL			
methods reported?		operationalized through specification				
Reporting of	Yes/no	The outcome of the above model measures the degree of		CAN'T TELL		
indicators/questions		vulnerability to food insecurity for each household. The				
used to		probability of a household being vulnerable to food				
operationalise		insecurity is \geq 0.5 and the probability a household not				
construct?		being vulnerable to food insecurity is < 0.5, thus a				
		threshold of 0.5 was used.				
Sampling strategies	n/a	This is a threshold construct. Therefore it is				
reported?		operationalized through specification				
Sampling sizes	n/a	This is a threshold construct. Therefore it is				
reported?		operationalized through specification				

Data analysis	Yes/no	The other analyses carried out involved running the 2		
methods reported?		stage least squares regression model using SPSS to find		
		estimates for the vulnerability model. This involved a		
		double regression of the per capita cereal production		
		levels against household observable characteristics such		
		as age, gender, education status of the household head,		
		assess to extension services and other factors that were		
		considered pertinent in influencing cereal production. The		
		estimates obtained from the 2 stage least regression was		
		used to measure the degree of each household's		
		vulnerability to food insecurity. The estimated probability		
		was given by:		
		[]		
		The outcome of the above model measures the degree of		
		vulnerability to food insecurity for each household. The		
		probability of a household being vulnerable to food		
		insecurity is \geq 0.5 and the probability a household not		
		being vulnerable to food insecurity is < 0.5, thus a		
		threshold of 0.5 was used. Food insecurity increases the		
		chances of being negatively impacted by climate change.		
		Thus a household with a probability of < 0.5 has less		
		chances of being negatively impacted by climate change		
		and a household with a probability \geq 0.5 has greater		
		chances of being impacted by climate change.		

Transparency Assessment Article summary			
Article	Notenbaert et al (2013)		
Transparent operationalizations	Exposure; Institutional environment; Risks		
Partially transparent	Livelihood strategies;		
Not transparent	Livelihood assets; Livelihoods; Vulnerability Outcomes		

Structured summary of operationalization – validity assessment Construct: Exposure Article: Notenbaert et al (2013)		1.1 DCM Appropriate	1.2 valid empirical rep?	1. conclusion - Valid?	2. Feasible?							
						<u>Criterion</u>	Assessment	Quoted text or Rationale for negative assessment				
						Construct defined?	Yes	risks (or a chain of risky events) that people confront in pursuit of their livelihoods, (Turner et al. 2003).	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell
Data collection methods reported?	Yes	In this study, we assume the exposure to climate change and variability of households in the same village to be equal. Differences in vulnerability, described as outcomes of this exposure, are therefore attributed to differences in sensitivity and adaptive capacity only. [] We also believe that the overall assumption of equal exposure is sensible in the fairly homogenous landscape of Mabalane district and the relatively clustered villages as our unit of analysis. When analyzing communities spread out in more complex land- scapes or in rugged terrain, this assumption will not nec- essarily hold true	YES		YES							
Reporting of indicators/questions used to operationalise construct?	Yes	In this study, we assume the exposure to climate change and variability of households in the same village to be equal. Differences in vulnerability, described as outcomes of this exposure, are therefore attributed to differences in sensitivity and adaptive capacity only. [] We also believe that the overall assumption of equal exposure is sensible in the fairly homogenous landscape of Mabalane district and the relatively clustered villages		YES								

		as our unit of analysis. When analyzing communities	
		spread out in more complex land- scapes or in rugged	
		terrain, this assumption will not nec- essarily hold true	
Compling strategies	Vac		
Sampling strategies	Yes	In this study, we assume the exposure to climate change	
reported?		and variability of households in the same village to be	
		equal. Differences in vulnerability, described as outcomes	
		of this exposure, are therefore attributed to differences in	
		sensitivity and adaptive capacity only.	
		We also believe that the overall assumption of equal	
		exposure is sensible in the fairly homogenous landscape	
		of Mabalane district and the relatively clustered villages	
		as our unit of analysis. When analyzing communities	
		spread out in more complex land- scapes or in rugged	
		terrain, this assumption will not nec- essarily hold true	
Sampling sizes	Yes	In this study, we assume the exposure to climate change	
reported?		and variability of households in the same village to be	
		equal. Differences in vulnerability, described as outcomes	
		of this exposure, are therefore attributed to differences in	
		sensitivity and adaptive capacity only.	
		[]	
		We also believe that the overall assumption of equal	
		exposure is sensible in the fairly homogenous landscape	
		of Mabalane district and the relatively clustered villages	
		as our unit of analysis. When analyzing communities	
		spread out in more complex land- scapes or in rugged	
		terrain, this assumption will not nec- essarily hold true	
Data analysis	Yes	In this study, we assume the exposure to climate change	
methods reported?		and variability of households in the same village to be	
		equal. Differences in vulnerability, described as outcomes	
		of this exposure, are therefore attributed to differences in	
		sensitivity and adaptive capacity only.	
		[]	
		We also believe that the overall assumption of equal	
		exposure is sensible in the fairly homogenous landscape	
		of Mabalane district and the relatively clustered villages	
		as our unit of analysis. When analyzing communities	
		spread out in more complex land- scapes or in rugged	

terrain, this assumption will not nec- essarily hold true				
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Structured summary	of operationaliz	zation – validity assessment	1.1 DCM	1.2 valid	1.	2. Feasible?
Construct: Institutiona	al environment		Appropriate	empirical	conclusion -	
Article: Notenbaert et	t al (2013)			rep?	Valid?	
<u>Criterion</u>	<u>Assessment</u>	Quoted text or Rationale for negative assessment				
Construct defined?	Yes	(Turner et al. 2003).	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell
Data collection	Yes	The factors that make up these policies, institutions and	NO			
methods reported?		processes can be changed, but will usually require action at "higher" levels (Messer and Townsley 2003). As with			NO	
		the exposure, we therefore assume these are equal for all households in the same village.				
Reporting of indicators/questions used to operationalise construct?	Yes	The factors that make up these policies, institutions and processes can be changed, but will usually require action at "higher" levels (Messer and Townsley 2003). As with the exposure, we therefore assume these are equal for all households in the same village.		NO		
Sampling strategies reported?	Yes	The factors that make up these policies, institutions and processes can be changed, but will usually require action at "higher" levels (Messer and Townsley 2003). As with the exposure, we therefore assume these are equal for all households in the same village.				
Sampling sizes reported?	Yes	The factors that make up these policies, institutions and processes can be changed, but will usually require action at "higher" levels (Messer and Townsley 2003). As with the exposure, we therefore assume these are equal for all households in the same village.				
Data analysis methods reported?	Yes	The factors that make up these policies, institutions and processes can be changed, but will usually require action at "higher" levels (Messer and Townsley 2003). As with the exposure, we therefore assume these are equal for all households in the same village.				

Structured summary	of operationaliz	zation – validity assessment	1.1 DCM	1.2 valid	1.	2. Feasible?
Construct: Risks			Appropriate	empirical	conclusion -	
Article: Notenbaert et	: al (2013)			rep?	Valid?	
<u>Criterion</u>	<u>Assessment</u>	Quoted text or Rationale for negative assessment				
Construct defined?	Yes	(Turner et al. 2003).	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell
Data collection methods reported?	Yes	In this study, we assume the exposure to climate change and variability of households in the same village to be equal. Differences in vulnerability, described as outcomes of this exposure, are therefore attributed to differences in sensitivity and adaptive capacity only. [] We also believe that the overall assumption of equal exposure is sensible in the fairly homogenous landscape of Mabalane district and the relatively clustered villages as our unit of analysis. When analyzing communities spread out in more complex land- scapes or in rugged terrain, this assumption will not nec- essarily hold true	NO		NO	
Reporting of indicators/questions used to operationalise construct?	Yes	In this study, we assume the exposure to climate change and variability of households in the same village to be equal. Differences in vulnerability, described as outcomes of this exposure, are therefore attributed to differences in sensitivity and adaptive capacity only. [] We also believe that the overall assumption of equal exposure is sensible in the fairly homogenous landscape of Mabalane district and the relatively clustered villages as our unit of analysis. When analyzing communities spread out in more complex land- scapes or in rugged terrain, this assumption will not nec- essarily hold true		NO		
Sampling strategies reported?	Yes	In this study, we assume the exposure to climate change and variability of households in the same village to be equal. Differences in vulnerability, described as outcomes of this exposure, are therefore attributed to differences in				

				г
		sensitivity and adaptive capacity only.		
		[]		
		We also believe that the overall assumption of equal		
		exposure is sensible in the fairly homogenous landscape		
		of Mabalane district and the relatively clustered villages		
		as our unit of analysis. When analyzing communities		
		spread out in more complex land- scapes or in rugged		
		terrain, this assumption will not nec- essarily hold true		
Sampling sizes	Yes	In this study, we assume the exposure to climate change		
reported?		and variability of households in the same village to be		
		equal. Differences in vulnerability, described as outcomes		
		of this exposure, are therefore attributed to differences in		
		sensitivity and adaptive capacity only.		
		[]		
		We also believe that the overall assumption of equal		
		exposure is sensible in the fairly homogenous landscape		
		of Mabalane district and the relatively clustered villages		
		as our unit of analysis. When analyzing communities		
		spread out in more complex land- scapes or in rugged		
		terrain, this assumption will not nec- essarily hold true		
Data analysis	Yes	In this study, we assume the exposure to climate change		
methods reported?		and variability of households in the same village to be		
		equal. Differences in vulnerability, described as outcomes		
		of this exposure, are therefore attributed to differences in		
		sensitivity and adaptive capacity only.		
		[]		
		We also believe that the overall assumption of equal		
		exposure is sensible in the fairly homogenous landscape		
		of Mabalane district and the relatively clustered villages		
		as our unit of analysis. When analyzing communities		
		spread out in more complex land- scapes or in rugged		
		terrain, this assumption will not nec- essarily hold true		

Transparency Assessment Article s	ummary
Article	Piya et al (2012)
Transparent operationalizations	Exposure; Financial capital; Human capital; natural capital; physical capital; sensitivity; social capital
Partially transparent	
Not transparent	

Structured summary	of operationali	zation – validity assessment	1.1 DCM	1.2 valid	1.	2. Feasible?
Construct: Exposure			Appropriate	empirical	conclusion -	
Article: Piya et al (201	L2)			rep?	Valid?	
<u>Criterion</u>	Assessment	Quoted text or Rationale for negative assessment				
Construct defined?	Yes	Exposure is the nature and degree to which a system is exposed to significant climatic variations.	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell
Data collection methods reported?	Yes	This study is based on the primary data collected by household survey conducted in two phases. The first phase of household survey was conducted in February-March 2010 and the second phase in May-June 2011. [] The latitude, longitude and altitude of the sample households were recorded during the second phase of field visit. This paper also makes use of raw monthly minimum and maximum temperature and monthly precipitation data obtained from Department of Hydrology and Meteorology (DHM) in Kathmandu, Nepal for the time period of 32 years, from 1977-2008. Temperature data was obtained from 49 stations and precipitation data from 218 stations distributed all over the country. The temperature and precipitation at the household level was interpolated for each year from the weather stations using the latitude-longitude-altitude information of each household by ordinary kriging method in ArcGIS 10.	YES		YES	CAN'T TELL
Reporting of indicators/questions	Yes	3.2.1 Exposure For this study, historical changes in climate variables and occurrence of extreme		YES		

	12 12 1			(
used to		s are taken as in		• •
operationalise	-	nge in average		
construct?		average annual		
	_	l precipitation f	-	
	-	t the historical o	-	
				I household was
	-	or each year fro		
		tations and 218		
		ngitude, and al		
		ie households b		
	ArcGIS10. The	coefficient of th	ne trends of cl	imate variables
	is calculated se	eparately for ea	ch household.	
	Floods/landslic	des, droughts ar	nd hailstorms	are the most
		urring natural d		
	Number of occ	urrence of thes	e extreme ev	ents for the last
	ten years was o	obtained for ea	ch household	from the
	household surv	vey (Appendix 1). It was hypo	thesized that
		e of change of th		
	-	-		gher will be the
	_	e households to		-
	extremes.			0
		tors for exposu	re	
			-	
	Component	Description	Unit	Hypothesized
	Indicators	of the	onic	relation
	indicators	Indicators		relation
	Historical	Rate of	Coefficient	+
			of trend	т
	change in	change in	ortrend	
	climate	average		
	Variables	annual		
		minimum		
		temperature		
		(1977 –		
		2008)		
		Rate of	Coefficient	+
		change in	of trend	
		average		
		annual		

					1 1		 1
			maximum				
			temperature				
			(1977 –				
			2008)				
			Rate of	Coefficient	+		
			change in	of trend			
			average				
			annual				
			precipitation				
			(1977 –				
		-	2008)				
		Extreme	Frequency	Number	+		
		climate	of climate				1
		events	related				
			natural disasters				
			(floods,				
			landslides,				
			droughts				
			and				
			hailstorms)				
			over the last				
			10 years				
			10 years				
Sampling strategies	Yes	Sixty random	y selected house	eholds from e	ach VDC form		
reported?		-	, r the household				
		[]		-			1
			al 240 househol	ds covered in	2010 field		
			useholds in Chity				
		Makwanpur, S	54 household in	Dhading, and	53 households		1
			ld be revisited in				
Sampling sizes	Yes	Sixty random	y selected house	eholds from e	ach VDC form		
reported?			r the household	survey.			
		[]					
			al 240 househol				1
			useholds in Chity				
	1		54 household in	Dhading and	F2 households		1

		in Gorkha could be revisited in 2011 survey; thus the final sample constitutes a total of 221 households. [] temperature and monthly precipitation data obtained from Department of Hydrology and Meteorology (DHM) in Kathmandu, Nepal for the time period of 32 years, from 1977-2008. Temperature data was obtained from 49 stations and precipitation data from 218 stations distributed all over the country.		
Data analysis methods reported?	Yes	Having chosen the suitable indicators, now these need to be normalized so as to bring the values of the indicators within the comparable range (Nelson, et al., 2010b; Gbetibouo & Ringler, 2009; Vincent, 2004). Normalization is done by subtracting the mean from the observed value and dividing by the standard deviation for each indicator. <i>Normalized value = Observed Value / Mean standard deviation</i> Next, weights should be assigned to these indicators. []		
		The normalized variables are then multiplied with the assigned weights to construct the indices (for exposure, sensitivity, and adaptive capacity separately) using the following formulae: $Ij = \sum_{i=1}^{k} b_i[(a_{ii} - x_i)/s_i]$ where, '1' is the respective index value, 'b' is the loadings from first component from PCA (PCA1) taken as weights for respective indicators, 'a' is the indicator value, 'x' is the mean indicator value, and 's' is the standard deviation of the indicators. Finally, vulnerability index for each household is calculated as: V = E + S - AC, where, V is the vulnerability index, E the exposure index, S is the sensitivity index and AC is the adaptive capacity index for respective household.		

Structured summary	of operationali	zation – validity assessment	1.1 DCM	1.2 valid	1.	2. Feasible?
Construct: Financial C	apital		Appropriate	empirical	conclusion -	
Article: Piya et al (201	2)			rep?	Valid?	
Criterion	Assessment	Quoted text or Rationale for negative assessment				
Construct defined?	Yes	Ellis (2000) and DFID (1999)	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell
Data collection methods reported?	Yes	This study is based on the primary data collected by household survey conducted in two phases. The first phase of household survey was conducted in February-March 2010 and the second phase in May-June 2011.	YES		YES	
Reporting of indicators/questions used to operationalise construct?	Yes	Gross household annual income, livelihood diversification index, household savings, and ownership of small livestock (goat, poultry, and pig) are taken as the indicators of financial assets. These indicators of financial assets are not specific to climate shocks only. Gross annual income of the household is the sum total of the cash and non-cash income from 11 different sources shown in Appendix 2. Higher income means greater availability of resources at disposal to maximize positive livelihood outcomes. Besides the amount of annual income, the sources from which the income is derived also need to be considered. If all of the income is derived from farming alone, then such income will be adversely affected during the years of bad weather. On the other hand, if the income is derived from more than one source, then risk will be distributed among the sources. In order to capture this aspect of income, Livelihood Diversification Index (LDI) is calculated; higher diversification indicating better ability of the household to switch among the activities when needed. Herfindahl index of diversification is used (Kimenju & Tschirley, 2009), which is calculated as Dk = $1 - \sum_{i=1N} (S_{i,k})^2$ where, Dk is the diversification index, i is the specific livelihood activity, N is the total number of activities being considered, k is the particular household, and Si,k is the		YES		

		household (see disposal, house out of their inc investments lik buffer during t livestock are al keep these live	ivity to the total l e Appendix 2). In a eholds which are a ome will be able the family education he times of need. so important sou stock as buffer to y back the loan th	addition to able to mak to make pro on or use th For Chepa rces of cash o sell during	income at se some savings oductive e savings as ngs, small n income; they the times of	
		Component	Description of	Unit	Hypothesized	
		Indicators Financial Assets	the Indicators Gross household annual income	NRs	relation +	
			Livelihood Diversification Index	-	+	
			Total household savings	NRs	+	
			Ownership of goat, poultry, and pig	LSU	+	
			Memberships in CBOs	Number	+	
Sampling strategies reported?	Yes	the sample for [] Out of the tota survey, 58 hou	selected househ the household su l 240 households seholds in Chitwa 4 household in Dł	rvey. covered in n, 56 house	2010 field eholds in	
		in Gorkha coul	d be revisited in 2	011 survey	.,	
Sampling sizes reported?	Yes		selected household su		ach VDC form	

				T
	sample constitutes a total of 221 households.			
Ves	Having chosen the suitable indicators now these need to			
105	-			
	-			
	Yes	Out of the total 240 households covered in 2010 field survey, 58 households in Chitwan, 56 households in Makwanpur, 54 household in Dhading, and 53 households in Gorkha could be revisited in 2011 survey; thus the final sample constitutes a total of 221 households.YesHaving chosen the suitable indicators, now these need to be normalized so as to bring the values of the indicators within the comparable range (Nelson, et al., 2010b; Gbetibouo & Ringler, 2009; Vincent, 2004). Normalization is done by subtracting the mean from the observed value and dividing by the standard deviation for each indicator. Normalized value = Observed Value / Mean standard deviationNext, weights should be assigned to these indicators. [] Assigning weight by Principal Component Analysis (PCA) following Filmer and Pritchett (2001) is thus preferred compared to the former two methods (Nelson et al., 2010b; Gbetibouo & Ringler, 2009; Cutter, Boruff, & Shirley, 2003). PCA was run for the selected indicators of exposure, sensitivity, and adaptive capacity separately in Data Analysis and Statistical Software (STATA10) software for assigning the weights. The loadings from the first component of PCA are used as the weights for the indicators. The weights assigned for each indicator varies between -1 and +1, sign of the indicators used to construct the respective index. The magnitude of the weights describes the contribution of each indicator to the value of the index. PCA was run for the indicators of adaptive capacity. The first-step PCA was run for the indicators of each adaptive capacity. Stepwise PCA was run for the indicators of adaptive capacity. The first-step PCA was run for the indicators of each asset group separately to observe the relative importance of indicators within each asset category. From the weights obtained from first-step PCA, ind	survey, 58 households in Chitwan, 56 households in Makwanpur, 54 household in Dhading, and 53 households in Gorkha could be revisited in 2011 survey; thus the final sample constitutes a total of 221 households. Yes Having chosen the suitable indicators, now these need to be normalized so as to bring the values of the indicators within the comparable range (Nelson, et al., 2010b; Gbetibouo & Ringler, 2009; Vincent, 2004). Normalization is done by subtracting the mean from the observed value and dividing by the standard deviation for each indicator. Normalized value = Observed Value / Mean standard deviation Next, weights should be assigned to these indicators. [] Assigning weight by Principal Component Analysis (PCA) following Filmer and Pritchett (2001) is thus preferred compared to the former two methods (Nelson et al., 2010b; Gbetibouo & Ringler, 2009; Cutter, Boruff, & Shirley, 2003). PCA was run for the selected indicators of exposure, sensitivity, and adaptive capacity separately in Data Analysis and Statistical Software (STATA10) software for assigning the weights. The loadings from the first component of PCA are used as the weights for the indicators used to construct the respective index. The magnitude of the weight describes the contribution of each indicator to the value of the index. PCA was run separately for the indicators of adaptive capacity. Stepwise PCA was run for the indicators of adaptive capacity. Stepwise PCA was run for the indicators of adaptive capacity. Stepwise PCA was run for the indicators of adaptive capacity. The first-step PCA was run for the indicators of adaptive capacity. Stepwise PCA was run for the indicators of adaptive capacity. The first-step PCA was run for the relative importance of indic	survey, 58 households in Chitwan, 56 households in Makwanpur, 54 household in Dhading, and 53 households in Gorkha could be revisited in 2011 survey; thus the final sample constitutes a total of 221 households. Yes Having chosen the suitable indicators, now these need to be normalized so as to bring the values of the indicators within the comparable range (Nelson, et al., 2010b; Gbetibouo & Ringler, 2009; Vincent, 2004). Normalization is done by subtracting the mean from the observed value and dividing by the standard deviation for each indicator. Normalized value = Observed Value / Mean standard deviation Next, weights should be assigned to these indicators. [] Assigning weight by Principal Component Analysis (PCA) following Filmer and Pritchett (2001) is thus preferred compared to the former two methods (Nelson et al., 2010b; Gbetibouo & Ringler, 2009; Cutter, Boruff, & Shirley, 2003). PCA was run for the selected indicators of exposure, sensitivity, and adaptive capacity separately in Data Analysis and Statistical Software (STATAIO) software for assigning the weights. The loadings from the first component of PCA are used as the weights for the indicators. The

Structured summary	of operationali	zation – validity assessment	1.1 DCM	1.2 valid	1.	2. Feasible?
Construct: Human Ca	pital		Appropriate	empirical	conclusion -	
Article: Piya et al (201	.2)			rep?	Valid?	
<u>Criterion</u>	Assessment	Quoted text or Rationale for negative assessment				
Construct defined?	Yes	Ellis (2000) and DFID (1999)	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell
Data collection methods reported?	Yes	This study is based on the primary data collected by household survey conducted in two phases. The first phase of household survey was conducted in February-March 2010 and the second phase in May-June 2011.	YES		YES	YES
Reporting of indicators/questions used to	Yes	Human asset is represented by highest qualification in the family; trainings or vocational courses attended by the family members; and		YES		

operationalise					t directly related		
construct?			; however they				
			of human capab	-			
		-	mal education				
			income by unde	-			
			h are less clima				
			-		e households to		
			isks. Furthermo				
					o buffer the risks		
					olds with higher		
			atio will have me				
			eby reducing th				
				io is commo	n to any types of		
l		shocks includir	ng climate.				
			1				
		Component	Description	Unit	Hypothesized		
		Indicators	of the		relation		
			Indicators				
		Human	Highest	Number	+		
		Assets	qualification	of			
			in the family	schooling			
				years			
			Dependency	-	+		
			Ratio				
			Trainings or	Number	-		
			vocational				
			course				
l			attended by				
			family				
			members				
				•			
Sampling strategies	Yes	Sixty randomly	selected house	eholds from e	each VDC form		
reported?		the sample for	the household	survey.			
		[]					
		Out of the tota	al 240 househol	ds covered in	1 2010 field		
l		survey, 58 hou	seholds in Chity	wan, 56 hous	eholds in		
		Makwanpur, 5	4 household in	Dhading, and	d 53 households		

		in Gorkha could be revisited in 2011 survey;		
Sampling sizes reported?	Yes	Sixty randomly selected households from each VDC form the sample for the household survey. [] Out of the total 240 households covered in 2010 field survey, 58 households in Chitwan, 56 households in Makwanpur, 54 household in Dhading, and 53 households in Gorkha could be revisited in 2011 survey; thus the final sample constitutes a total of 221 households.		
Data analysis methods reported?	Yes	 Having chosen the suitable indicators, now these need to be normalized so as to bring the values of the indicators within the comparable range (Nelson, et al., 2010b; Gbetibouo & Ringler, 2009; Vincent, 2004). Normalization is done by subtracting the mean from the observed value and dividing by the standard deviation for each indicator. Normalized value = Observed Value / Mean standard de viation Next, weights should be assigned to these indicators. [] Assigning weight by Principal Component Analysis (PCA) following Filmer and Pritchett (2001) is thus preferred compared to the former two methods (Nelson et al., 2010b; Gbetibouo & Ringler, 2009; Cutter, Boruff, & Shirley, 2003). PCA was run for the selected indicators of exposure, sensitivity, and adaptive capacity separately in Data Analysis and Statistical Software (STATA10) software for assigning the weights. The loadings from the first component of PCA are used as the weights for the indicators. The weights assigned for each indicator varies between -1 and +1, sign of the indicators denoting the weights describes the contribution of each indicator to the value of the index. PCA was run separately for the indicators of exposure, sensitivity and adaptive capacity. Stepwise PCA was run for the indicators of adaptive 		

capacity. The first-step PCA was run for the indicators of				
importance of indicators within each asset category. From				
the weights obtained from first-step PCA, individual index				
values for each asset type was calculated. Second-step PCA				
was run using the index values for each of the five asset				
types to analyze which asset group contributes the most to				
the total adaptive capacity. Overall adaptive capacity index				
was calculated using the weights (loadings) obtained from				
the second step PCA run for the five asset categories.				
The normalized variables are then multiplied with the				
assigned weights to construct the indices (for exposure,				
sensitivity, and adaptive capacity separately) using the				
following formulae:				
$Ij = \sum_{i=1}^{k} b_i [(a_{ji} - x_i)/s_i]$				
where, 'l' is the respective index value, 'b' is the loadings				
from first component from PCA (PCA1) taken as weights				
for respective indicators, 'a' is the indicator value, 'x' is the				
mean indicator value, and 's' is the standard deviation of				
the indicators. Finally, vulnerability index for each				
household is calculated as: $V = E + S - AC$, where, V is the				
vulnerability index, E the exposure index, S is the sensitivity				
index and AC is the adaptive capacity index for respective				
household.				
	each asset group separately to observe the relative importance of indicators within each asset category. From the weights obtained from first-step PCA, individual index values for each asset type was calculated. Second-step PCA was run using the index values for each of the five asset types to analyze which asset group contributes the most to the total adaptive capacity. Overall adaptive capacity index was calculated using the weights (loadings) obtained from the second step PCA run for the five asset categories. The normalized variables are then multiplied with the assigned weights to construct the indices (for exposure, sensitivity, and adaptive capacity separately) using the following formulae: $Ij = \sum_{i=1}^{k} b_i[(a_{ii} - x_i)/s_i]$ where, '1' is the respective index value, 'b' is the loadings from first component from PCA (PCA1) taken as weights for respective indicators, 'a' is the indicator value, 'x' is the mean indicator value, and 's' is the standard deviation of the indicators. Finally, vulnerability index for each household is calculated as: V = E + S - AC, where, V is the vulnerability index, E the exposure index, S is the sensitivity index and AC is the adaptive capacity index for respective	each asset group separately to observe the relative importance of indicators within each asset category. From the weights obtained from first-step PCA, individual index values for each asset type was calculated. Second-step PCA was run using the index values for each of the five asset types to analyze which asset group contributes the most to the total adaptive capacity. Overall adaptive capacity index was calculated using the weights (loadings) obtained from the second step PCA run for the five asset categories. The normalized variables are then multiplied with the assigned weights to construct the indices (for exposure, sensitivity, and adaptive capacity separately) using the following formulae: $Ij = \sum_{i=1}^{k} bi[(a_{ii} - x_i)/s_i]$ where, '1' is the respective index value, 'b' is the loadings from first component from PCA (PCA1) taken as weights for respective indicators, 'a' is the standard deviation of the indicators. Finally, vulnerability index for each household is calculated as: $V = E + S - AC$, where, V is the vulnerability index, E the exposure index, S is the sensitivity index and AC is the adaptive capacity index for respective	each asset group separately to observe the relative importance of indicators within each asset category. From the weights obtained from first-step PCA, individual index values for each asset type was calculated. Second-step PCA was run using the index values for each of the five asset types to analyze which asset group contributes the most to the total adaptive capacity. Overall adaptive capacity index was calculated using the weights (loadings) obtained from the second step PCA run for the five asset categories. The normalized variables are then multiplied with the assigned weights to construct the indices (for exposure, sensitivity, and adaptive capacity separately) using the following formulae: $Ij = \sum^{k_{i=1}} b_i[(a_{ii} - x_i)/s_i]$ where, 'I' is the respective index value, 'b' is the loadings from first component from PCA (PCA1) taken as weights for respective indicators, 'a' is the indicator value, 'x' is the mean indicator value, and 's' is the standard deviation of the indicators. Finally, vulnerability index for each household is calculated as: $V = E + S - AC$, where, V is the vulnerability index, E the exposure index, S is the sensitivity index and AC is the adaptive capacity index for respective	each asset group separately to observe the relative importance of indicators within each asset category. From the weights obtained from first-step PCA, individual index values for each asset type was calculated. Second-step PCA was run using the index values for each of the five asset types to analyze which asset group contributes the most to the total adaptive capacity. Overall adaptive capacity index was calculated using the weights (loadings) obtained from the second step PCA run for the five asset categories. The normalized variables are then multiplied with the assigned weights to construct the indices (for exposure, sensitivity, and adaptive capacity separately) using the following formulae: $Ij = \sum^{k}_{i=1} bi[(a_{ii} - x_i)/s_i]$ where, '1' is the respective index value, 'b' is the loadings from first component from PCA (PCA1) taken as weights for respective indicators, 'a' is the standard deviation of the indicators. Finally, vulnerability index for each household is calculated as: $V = E + S - AC$, where, V is the vulnerability index, E the exposure index, S is the sensitivity index and AC is the adaptive capacity index for respective

Structured summary	Structured summary of operationalization – validity assessment			1.2 valid	1.	2. Feasible?
Construct: Natural Capital		Appropriate	empirical	conclusion -		
Article: Piya et al (2012)			rep?	Valid?		
<u>Criterion</u>	<u>Assessment</u>	Quoted text or Rationale for negative assessment				
Construct defined?	Yes	Ellis (2000) and DFID (1999)	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell
Data collection methods reported?	Yes	This study is based on the primary data collected by household survey conducted in two phases. The first phase of household survey was conducted in February-March 2010 and the second phase	YES		YES	YES

		in May-June 20)11.				1	
Reporting of	Yes		land possessed by	the house	eholds is taken			YES
indicators/questions		as an indicator	of natural					
used to		assets. Chepar	igs possess three	categories	of land.			
operationalise			et) is the most pro					
construct?			an irrigation sour					
			may not be irrigat					
			more productive		• .	1		
			is unterraced slo					
			r own nature, are					
			than other types					
			et and bari) are le					
			eater risks of land		•			
			during rains. Hou					
			ind bari compared	-				
			isasters. Higher sl bari) also means					
			us higher adaptive	-				
			es the opposite.	• •	•			
			is the only means		· •			
			r indicator of hou		•			
		-,						
		Component	Description of	Unit	Hypothesized	1		
		Indicators	the Indicators		relation			
		Natural	Share of more	% of	+			
		Assets	productive	total				
			land (khet +					
			bari)					
			possessed					
			Share of less	% of	+			
			productive	total				
			land (khoriya)					
			possessed					
			Have bullock	Ordinal	+			
			(0 = No, 1 =					
			Yes)					
Sampling strategies	Yes		selected househ		each VDC form			
reported?		the sample for	the household su	irvey.				

Sampling sizes reported?	Yes	 [] Out of the total 240 households covered in 2010 field survey, 58 households in Chitwan, 56 households in Makwanpur, 54 household in Dhading, and 53 households in Gorkha could be revisited in 2011 survey; Sixty randomly selected households from each VDC form the sample for the household survey. [] Out of the total 240 households covered in 2010 field survey, 58 households in Chitwan, 56 households in Makwanpur, 54 household in Dhading, and 53 households in Gorkha could be revisited in 2011 survey; thus the final sample constitutes a total of 221 households. 		
Data analysis methods reported?	Yes	 Having chosen the suitable indicators, now these need to be normalized so as to bring the values of the indicators within the comparable range (Nelson, et al., 2010b; Gbetibouo & Ringler, 2009; Vincent, 2004). Normalization is done by subtracting the mean from the observed value and dividing by the standard deviation for each indicator. Normalized value = Observed Value / Mean standard deviation Next, weights should be assigned to these indicators. [] Assigning weight by Principal Component Analysis (PCA) following Filmer and Pritchett (2001) is thus preferred compared to the former two methods (Nelson et al., 2010b; Gbetibouo & Ringler, 2009; Cutter, Boruff, & Shirley, 2003). PCA was run for the selected indicators of exposure, sensitivity, and adaptive capacity separately in Data Analysis and Statistical Software (STATA10) software for assigning the weights. The loadings from the first component of PCA are used as the weights for the indicator varies between -1 and +1, sign of the indicators denoting the direction of relationship with other indicators used to construct the respective index. The magnitude of the 		

weights describes the contribution of each indicator to the	
value of the index. PCA was run separately for the	
indicators of exposure, sensitivity and adaptive capacity.	
Stepwise PCA was run for the indicators of adaptive	
capacity. The first-step PCA was run for the indicators of	
each asset group separately to observe the relative	
importance of indicators within each asset category. From	
the weights obtained from first-step PCA, individual index	
values for each asset type was calculated. Second-step PCA	
was run using the index values for each of the five asset	
types to analyze which asset group contributes the most to	
the total adaptive capacity. Overall adaptive capacity index	
was calculated using the weights (loadings) obtained from	
the second step PCA run for the five asset categories.	
The normalized variables are then multiplied with the	
assigned weights to construct the indices (for exposure,	
sensitivity, and adaptive capacity separately) using the	
following formulae:	
$Ij = \sum_{i=1}^{k} b_i[(a_{ji} - x_i)/s_i]$	
where, 'l' is the respective index value, 'b' is the loadings	
from first component from PCA (PCA1) taken as weights	
for respective indicators, 'a' is the indicator value, 'x' is the	
mean indicator value, and 's' is the standard deviation of	
the indicators. Finally, vulnerability index for each	
household is calculated as: V = E + S – AC, where, V is the	
vulnerability index, E the exposure index, S is the	
sensitivity index and AC is the adaptive capacity index for	
respective household.	

Structured summary	of operationali	zation – validity assessment	1.1 DCM	1.2 valid	1.	2.
Construct: Physical C	apital		Appropriate	empirical	conclusion	Feasible?
Article: Piya et al (201	.2)			rep?	- Valid?	
<u>Criterion</u>	Assessment	Quoted text or Rationale for negative assessment				
Construct defined?	Yes	Ellis (2000) and DFID (1999)	Yes/ no/	Yes/ no/	Yes/ no/	Yes/ no/
			can't tell	can't tell	can't tell	can't tell

Data collection	Yes	This study is ba	ased on the primary data o	ollected by	/ household	YES			
methods reported?		survey conduc						YES	
·			ne first phase of household	l survey wa	is conducted in				
			ch 2010 and the second ph						
Reporting of	Yes	Indicators for	the physical assets are type	e of house,	ownership of		YES		
indicators/questions		devices to acce	ess						
used to		information (n	nobile phone and radio), w	alking dist	ance to the				
operationalise			and irrigated land. Out of t	-					
construct?			are directly related to clim						
		better quality	house will improve the cap	acity to w	thstand the				
		risks from extr	eme climate events. Type	of house w	as indicated				
		from a value o	f 1-3, 3 indicating the mos	t durable t	pe of house				
		(see Table 3).	Ownership of mobile phon	e and radio	o will increase				
		the adaptive c	apacity through access to	weather re	lated				
		information. B	etter access to information	n enables a	household in				
		planning proad	ctive adaptation measures	against cli	mate risks.				
		Walking distar	nce to the nearest motor ro	oad, which	in this case is				
		also equivalen							
		inversely relat	ed to adaptive capacity as	household	located far				
		away from the	markets will be in a disad	vantageou	s position for				
		lacking the op	portunity of income generation	ation from	alternative				
			on-farm labor, which help i						
		during the per	iods of food shortage or cr	op failure.	Farther				
			the roads also symbolizes	-					
			nters are located at the roa		-				
		-	ce from the motor roads a						
			as the marketplace acts a						
			information exchange tak	-					
			ions providing extension s						
		-	ectly related to climate sh						
			ghts. Higher percentage of	-					
			ence on natural rain for ag	•	•				
		is becoming m	ore unpredictable with clin	mate chan	ge.				
		Component	Description of the	Unit	Hypothesized				
		Component	-	Unit					
		Indicators	Indicators	Ordinal	relation				
		Physical	Type of house (1 =	Ordinal	+				
		Assets	thatch roof,	value					L

			thatch/wooden wall; 2 = thatch roof, stone+mud wall; 3 = stone/tin/tile roof, stone/wood/brick+mud wall) Have devices to access information (mobile, radio) (0 = No, 1 = Yes) Walking distance to nearest motor road Irrigated land	Ordinal value Hours % of total	+ -
Sampling strategies reported?	Yes	sample for the [] Out of the tot households in	y selected households from e household survey. al 240 households covered Chitwan, 56 households in Dhading, and 53 household 111 survey;	in 2010 fie Makwang	eld survey, 58 our, 54
Sampling sizes reported?	Yes	Sixty randoml sample for the [] Out of the tot households in household in	y selected households from e household survey. al 240 households covered Chitwan, 56 households in Dhading, and 53 household 11 survey; thus the final sa	in 2010 fi Makwanp s in Gorkh	eld survey, 58 our, 54 a could be
Data analysis methods reported?	Yes	normalized so the values of et al., 2010b; Normalization value and divi	n the suitable indicators, no as to bring the indicators within the co Gbetibouo & Ringler, 2009; h is done by subtracting the ding by the standard deviat value = Observed Value	mparable Vincent, 2 mean froi tion for ea	range (Nelson, 2004). n the observed ch indicator.

de viation	
Next, weights should be assigned to these indicators.	
[]	
[] Assigning weight by Principal Component Analysis (PCA) following	
Filmer and Pritchett (2001) is thus preferred compared to the	
former two methods (Nelson et al., 2010b; Gbetibouo & Ringler,	
2009; Cutter, Boruff, & Shirley, 2003). PCA was run for the selected	
indicators of exposure, sensitivity, and adaptive capacity	
separately in Data Analysis and Statistical Software (STATA10)	
software for assigning the weights. The loadings from the first	
component of PCA are used as the weights for the indicators. The	
weights assigned for each indicator varies between -1 and +1, sign	
of the indicators denoting the direction of relationship with other	
indicators used to construct the respective index. The magnitude	
of the weights describes the contribution of each indicator to the	
value of the index. PCA was run separately for the indicators of	
exposure, sensitivity and adaptive capacity. Stepwise PCA was run	
for the indicators of adaptive capacity. The first-step PCA was run	
for the indicators of each asset group separately to observe the	
relative importance of indicators within each asset category. From	
the weights obtained from first-step PCA, individual index values	
for each asset type was calculated. Second-step PCA was run using	
the index values for each of the five asset types to analyze which	
asset group contributes the most to the total adaptive capacity.	
Overall adaptive capacity index was calculated using the weights	
(loadings) obtained from the second step PCA run for the five asset	
categories.	
The normalized variables are then multiplied with the assigned	
weights to construct the indices (for exposure, sensitivity, and	
adaptive capacity separately) using the following formulae:	
$Ij = \sum_{i=1}^{k} b_i[(a_{ji} - x_i)/s_i]$	
where, 'I' is the respective index value, 'b' is the loadings from first	
component from PCA (PCA1) taken as weights for respective	
indicators, 'a' is the indicator value, 'x' is the mean indicator value,	
and 's' is the standard deviation of the indicators. Finally,	
vulnerability index for each household is calculated as: $V = E + S - C$	
AC, where, V is the vulnerability index, E the exposure index, S is	
the sensitivity index and AC is the adaptive capacity index for	
The sensitivity index and AC is the adaptive capacity index for	

Structured summary	of operation	alization – validity assessment	1.1 DCM	1.2 valid	1.	2.
Construct: Sensitivity	Construct: Sensitivity			empirica	conclusio	Feasible
Article: Piya et al (20	rticle: Piya et al (2012)			l rep?	n - Valid?	?
<u>Criterion</u>	<u>Assessmen</u> <u>t</u>	Quoted text or Rationale for negative assessment				
Construct defined?	Yes	is the degree to which a system is affected, either adversely or beneficially by climate-related stimuli.	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell
Data collection methods reported?	Yes	This study is based on the primary data collected by household survey conducted in two phases. The first phase of household survey was conducted in February-March 2010 and the second phase in May-June 2011.	CAN'T TELL		YES	YES
Reporting of indicators/question s used to operationalise construct?	Yes	3.2.2 Sensitivity Sensitivity is given by the degree to which a system is modified or affected by an internal or external disturbance or set of disturbances (Gallopin, 2003). Livelihood impacts of climate related disasters were taken as the sensitivity indicator following Daze, Ambrose, & Ehrhart (2009) and Marshall et al. (2009). Deaths of family members and loss of properties (viz. land, livestock, and crop) due to climate related disasters over the last ten years represent the sensitivity for the purpose of this study. It is hypothesized that higher impacts of past climatic hazards will increase the sensitivity of the households to such events. The income structure will also determine the household sensitivity. Higher share of natural resource based income (composed of agriculture, livestock, forest, honey and handicrafts) will increase the sensitivity of the household as these sources are more dependent on climate; while higher share of non-natural resource based remunerative income sources (composed of salaried jobs, non-farm skilled jobs, and remittances from abroad) will reduce the sensitivity. These three income sources are categorized as remunerative sources because the return from these sources is comparatively higher than other sources of income. It was found that the annual income of the households with no income from any of these three sources (Piya, Maharjan, & Joshi,		YES		

2011b) The d	etailed breakdown of the share	ofvarious			
are given in A			ncome sources		
_	ators for sensitivity				
Componen	Description of the	Unit	Hypothesize		
t Indicators	Indicators		d relation		
Fatalities	Death of family members	Number	+		
	due to climate related	of family			
	disasters (floods, landslides)	member			
	over the last 10 years	S			
Damage to	Total land damaged by	Area in	+		
properties	flood/landslides over the	local			
	last 10 years	units			
		(Kattha4			
	Tatal Burston da atla dua ta)			
	Total livestock death due to flood/landslides/drought/h	Livestoc	+		
	ail over the last 10 years	k Standard			
	an over the last 10 years	Unit			
		(LSU5)			
	Total crop damage due to	Value in	+		
	flood/ landslides/ drought/	Nepali			
	hail over the last 10 years	Rupees			
		(NRs6)			
Income	Share of natural resource	%	+		
structure	based income (agriculture,				
	livestock, forest, honey, and				
	handicraft) to total income				
	Share of non-natural based	%	-		
	remunerative income				
	(salaried job, remittance,				
	skilled non-farm job) to total income				
		1			
4 1 Kattha = 0	033 ha				
	gates of different types of lives	tock kept at	kept at		
	standard unit calculated using t				
	= 1 LSU, 1 immature buffalo = 0		-		
calf = 0.4					

		LSU, 1 pig = 0.3 LSU, 1 sheep or goat = 0.2 LSU and 1 poultry = 0.1 LSU (CBS, 2003; Baral, 2005). 6 73 NRs = 1 US \$ at the time of field survey.		
Sampling strategies reported?	Yes	Sixty randomly selected households from each VDC form the sample for the household survey. [] Out of the total 240 households covered in 2010 field survey, 58 households in Chitwan, 56 households in Makwanpur, 54 household in Dhading, and 53 households in Gorkha could be revisited in 2011 survey;		
Sampling sizes reported?	Yes	Sixty randomly selected households from each VDC form the sample for the household survey. [] Out of the total 240 households covered in 2010 field survey, 58 households in Chitwan, 56 households in Makwanpur, 54 household in Dhading, and 53 households in Gorkha could be revisited in 2011 survey; thus the final sample constitutes a total of 221 households.		
Data analysis methods reported?	Yes	 Having chosen the suitable indicators, now these need to be normalized so as to bring the values of the indicators within the comparable range (Nelson, et al., 2010b; Gbetibouo & Ringler, 2009; Vincent, 2004). Normalization is done by subtracting the mean from the observed value and dividing by the standard deviation for each indicator. Normalized value = Observed Value / Mean standard deviation Next, weights should be assigned to these indicators. 		
		The normalized variables are then multiplied with the assigned weights to construct the indices (for exposure, sensitivity, and adaptive capacity separately) using the following formulae: $Ij = \sum_{i=1}^{k} b_i [(a_{ji} - x_i)/s_i]$ where, '1' is the respective index value, 'b' is the loadings from first component from PCA (PCA1) taken as weights for respective indicators, 'a' is the indicator value, 'x' is the mean indicator value, and 's' is the standard deviation of the indicators. Finally, vulnerability index for each household is calculated as: $V = E + S - AC$, where, V is the vulnerability		

index, E the exposure index, S is the sensitivity index and AC is the		
adaptive capacity index for respective household.		

Structured summary of operationalization – validity assessment				1.2 valid	1.	2.
Construct: Social Capi	ital		Appropriate	empirical	conclusion	Feasible?
Article: Piya et al (201	Article: Piya et al (2012)				- Valid?	
<u>Criterion</u>	<u>Assessment</u>	Quoted text or Rationale for negative assessment				
Construct defined?	Yes	Ellis (2000) and DFID (1999)	Yes/ no/	Yes/ no/	Yes/ no/	
			can't tell	can't tell	can't tell	can't tell
Data collection methods reported?	Yes	This study is based on the primary data collected by household survey conducted in	YES		YES	YES
		two phases. The first phase of household survey was conducted in February-March 2010 and the second phase in May-June 2011.				
Reporting of indicators/questions used to operationalise construct?	Yes	Finally, social asset is represented by the number of membership in formal community based organizations (CBOs) and access to credit. Membership in CBOs will improve the households' social networks and access to information through their constant contact with the outsiders during the meetings in CBOs. Also, management of resources like water collection tanks and forests is done jointly by the members of these CBOs. Such activities help in pooling risks across the households in a community. Access to credit is also taken as social assets because for the Chepangs, taking loans from social contacts is one of the most important strategies to cope with seasonal food shortages, which they repay by selling agricultural produce, livestock, or forest products. Thus, access to credits in this community is equivalent to the social safety nets against all types of shocks. Also, some semi-formal saving and credit organizations in the community have recently started providing interest-free loans for productive investment like vegetable farming, and rearing cattle. Thus, access to productive loans denotes the access of the households to existing credit providing organizations in the locality. Better the access to credit, higher will be the adaptive capacity of the households.		YES, MEH		

		Component	Description of the	Unit	Hypothesized		
		Indicators	Indicators		relation		
		Social	Memberships in	Number	+		
		Assets	CBOs				
			Access to credit (1 =	Ordinal	+		
			needed, but no	Value			
			access; 2 = credit				
			used only for				
			subsistence				
			purposes; 3 = credit				
			used for productive				
			investment +/-				
			subsistence; 4 = no				
			need)				
Sampling strategies	Yes	Sixty randomly	selected households fro	m each VD	C form the		
reported?			household survey.				
•		[]	,				
			al 240 households covere	d in 2010 f	ield survey, 58		
			Chitwan, 56 households		• •		
			hading, and 53 househo				
		revisited in 202	-				
Sampling sizes	Yes		selected households fro	m each VD	C form the		
reported?		sample for the	household survey.				
•		[]					
			al 240 households covere	d in 2010 f	ield survey, 58		
			Chitwan, 56 households		-		
			hading, and 53 househo				
			11 survey; thus the final				
		of 221 househ					
Data analysis	Yes	Having chosen	the suitable indicators,	now these i	need to be		
methods reported?		normalized so as to bring					
p			he indicators within the	comparable	e range (Nelson.		
		et al., 2010b; Gbetibouo & Ringler, 2009; Vincent, 2004).					
			is done by subtracting th				
			ling by the standard dev				
			value = Observed Valu				
		de <i>v</i> iation		e, means	innuun u		

	 r	
Next, weights should be assigned to these indicators.		
Assigning weight by Principal Component Analysis (PCA) following		
Filmer and Pritchett (2001) is thus preferred compared to the		
former two methods (Nelson et al., 2010b; Gbetibouo & Ringler,		
2009; Cutter, Boruff, & Shirley, 2003). PCA was run for the		
selected indicators of exposure, sensitivity, and adaptive capacity		
separately in Data Analysis and Statistical Software (STATA10)		
software for assigning the weights. The loadings from the first		
component of PCA are used as the weights for the indicators. The		
weights assigned for each indicator varies between -1 and +1, sign		
of the indicators denoting the direction of relationship with other		
indicators used to construct the respective index. The magnitude		
of the weights describes the contribution of each indicator to the		
value of the index. PCA was run separately for the indicators of		
exposure, sensitivity and adaptive capacity. Stepwise PCA was run		
for the indicators of adaptive capacity. The first-step PCA was run		
for the indicators of each asset group separately to observe the		
relative importance of indicators within each asset category. From		
the weights obtained from first-step PCA, individual index values		
for each asset type was calculated. Second-step PCA was run using		
the index values for each of the five asset types to analyze which		
asset group contributes the most to the total adaptive capacity.		
Overall adaptive capacity index was calculated using the weights		
(loadings) obtained from the second step PCA run for the five		
asset categories.		
The normalized variables are then multiplied with the assigned		
weights to construct the indices (for exposure, sensitivity, and		
adaptive capacity separately) using the following formulae:		
$I_{j} = \sum_{i=1}^{k} b_{i}[(a_{i} - x_{i})/s_{i}]$		
where, 'I' is the respective index value, 'b' is the loadings from first		
component from PCA (PCA1) taken as weights for respective		
indicators, 'a' is the indicator value, 'x' is the mean indicator value,		
and 's' is the standard deviation of the indicators. Finally,		
vulnerability index for each household is calculated as: $V = E + S -$		
AC, where, V is the vulnerability index, E the exposure index, S is		
the sensitivity index and AC is the adaptive capacity index for		
respective household.		
respective nousenolu.		

Transparency Assessment Article summary						
Article Sarris & Karfakis (2010)						
Transparent operationalizations	Covariate shocks; household consumption; idiosyncratic shocks					
Partially transparent						
Not transparent						

Structured summary of operationalization – validity assessment					1.1 DCM	1.2 valid	1.	2. Feasible?
Construct: covariate shocks					Appropriate	empirical	conclusion -	
Article: Sarris & Karfakis (2010)					rep?	Valid?		
<u>Criterion</u>	Assessment	Quoted text or Rationale for neg	ative a	<u>ssessment</u>				
Construct defined?	Yes	The proposed methodology complements the applications by Chaudhuri. et. al. (2002) and Christiaensen and			Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell
Data collection methods reported?	Yes	Subbarao (2005), through the inclusion of covariate risks The analysis of the paper will be based on a representative survey of 957 rural households in 45 villages done in the Kilimanjaro region, in November 2003, and a representative survey of 892 rural households in 36 villages done in the Ruvuma region in February-March 2004. The survey was repeated a year later [] The questionnaire was designed to investigate the complete socio-economic characteristics of households with a particular emphasis on their vulnerability to a variety of risks.			YES		YES	YES
Reporting of indicators/questions used to operationalise construct?	Yes	Table 2: Percentage of households affected by various shocks between 1999 and 2003, by region and status as cash crop grower or not. Health Death Illness Climatic				YES		

		Drought Excessive rains Agricultural production Harvest loss Livestock loss Post harvest cereal loss Post harvest cereal loss Economic Cash crop price shock Cereal price shock Unemployment Herebook Property Herebook
		Theft Fire/house destroyed Land loss
Sampling strategies reported?	Yes	based on a representative survey of 957 rural households in 45 villages done in the Kilimanjaro region, in November 2003, and a representative survey of 892 rural households in 36 villages done in the Ruvuma region in February- March 2004. The survey was repeated a year later for each region and was designed to be representative of rural farm households, and among them of cash crop (coffee in Kilimanjaro, coffee, tobacco and cashew nuts in Ruvuma) as well as non-cash crop producing households. The survey was not designed to sample the large-scale public and private coffee estates but only smallholders.
Sampling sizes reported?	Yes	The analysis of the paper will be based on a representative survey of 957 rural households in 45 villages done in the Kilimanjaro region, in November 2003, and a representative survey of 892 rural households in 36 villages done in the Ruvuma region in February-March 2004.Image: Comparison of the State of the S
Data analysis methods reported?	Yes	Table 5 exhibits the results of the (instrumental variable) regressions on consumption and the squared residuals of consumption as per equations (15) and (17). The key variable for the vulnerability analysis is the coefficient in the consumption regressions of crop income per acre.

Concerning the consumption per equivalent adult, it can		
be seen that it depends positively and significantly on		
aggregate crop productivity, the size of land, the size of		
household, several wealth variables such as the lagged		
value of the number of animals owned and the lagged		
value of consumer durables, the age of the household		
head (significant in Ruvuma), access to credit variables,		
and some education variables.		
The Durbin-Wu-Hausman test of the exogeneity of the		
crop productivity strongly rejects the hypothesis of		
exogeneity, so IV is appropriate. Table 6 presents the first		
stage regressions for the IV estimates. We use as		
instruments a variety of exogenous land characteristics, as		
well as weather shock variables, and lagged dummies for		
whether the farm household used fertilizer and chemicals,		
as well as the lagged number of coffee and cashew trees.		
The Sargan test does not invalidate the use of these		
instruments.		
It must be mentioned that in the consumption regressions		
the IV regression coefficient of crop income per acre is		
significantly larger in the IV regressions compared to the		
OLS estimates (the OLS estimates for these coefficients are		
0.028 for Kilimanjaro and 0.174 for Ruvuma, compared to		
0.144 and 0.411 for the IV regressions in table 5 for the		
two regions).		
The consumption regressions explain about 47 and 51		
percent of the variance of consumption in Kilimanjaro and		
Ruvuma respectively. The regressions of the squared		
residuals from the consumption regressions on the same		
explanatory variables as the ones in the consumption		
regressions (excluding the variables that are related to		
covariate and idiosyncratic shocks) reveal that fewer of		
the variables are significant. In Kilimanjaro the		
dependency ratio, the value of the dwelling, the number		
of small animals, and the membership in a social group are		
significant, while in Ruvuma, the only two significant		
variables are the dummies for whether the household		
receives remittances and whether the household has easy		
receives remittances and whether the household lids edsy		

 -	-		
access to seasonal credit. The regressions explain a rather			
small proportion of the error less than 10 percent in both			
regions). This suggests that unexplained components of			
consumption variability dominate any parts that maybe			
due to structural household specific factors.			
Tables 7 and 8 indicate the average vulnerability index in			
Kilimanjaro and Ruvuma by district, along with the			
proportions of the variance of consumption that are due			
to covariate factors, the average consumption per capita			
and the average headcount measures of poverty rates in			
both years of the survey. The first observation is that			
average vulnerability in Kilimanjaro is much lower than in			
Ruvuma (31 percent versus 60 percent). This is in line with			
the much larger poverty incidence in Ruvuma compared to			
Kilimanjaro that was indicated earlier (63.3 percent versus			
39.5 percent).			

Structured summary of operationalization – validity assessment		1.1 DCM	1.2 valid empirical	1. conclusion -	2. Feasible?	
Construct: household consumption		Appropriate				
Article: Sarris & Karfa	Article: Sarris & Karfakis (2010)			rep?	Valid?	
<u>Criterion</u>	Assessment	Quoted text or Rationale for negative assessment				
Construct defined?	Yes	consumption falling below a poverty threshold (Christiaensen and Subbarao 2004, Chaudhuri, et. al. 2002)	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell YES	Yes/ no/ can't tell
Data collection methods reported?	Yes	The analysis of the paper will be based on a representative survey of 957 rural households in 45 villages done in the Kilimanjaro region, in November 2003, and a representative survey of 892 rural households in 36 villages done in the Ruvuma region in February- March 2004. The survey was repeated a year later [] The questionnaire was designed to investigate the complete socio-economic characteristics of households with a particular emphasis on their vulnerability to a	YES			YES

		variety of risks.	
Reporting of	Yes	Table 1: General characteristics of rural households in	YES
indicators/questions		Kilimanjaro and Ruvuma	
used to		Annual per capita total expenditure	
operationalise		Annual per capita total income	
construct?			
Sampling strategies	Yes	based on a representative survey of 957 rural households	
reported?		in 45 villages done in the Kilimanjaro region, in November	
		2003, and a representative survey of 892 rural households	
		in 36 villages done in the Ruvuma region in February-	
		March 2004. The survey was repeated a year later for	
		each region and was designed to be representative of	
		rural farm households, and among them of cash crop	
		(coffee in Kilimanjaro, coffee, tobacco and cashew nuts in	
		Ruvuma) as well as non-cash crop producing households.	
		The survey was not designed to sample the large-scale	
		public and private coffee estates but only smallholders.	
Sampling sizes	Yes	The analysis of the paper will be based on a	
reported?		representative survey of 957 rural households in 45	
		villages done in the Kilimanjaro region, in November	
		2003, and a representative survey of 892 rural households	
		in 36 villages done in the Ruvuma region in February-	
<u> </u>		March 2004.	
Data analysis	Yes	Table 5 exhibits the results of the (instrumental variable)	
methods reported?		regressions on consumption and the squared residuals of	
		consumption as per equations (15) and (17). The key	
		variable for the vulnerability analysis is the coefficient in	
		the consumption regressions of crop income per acre.	
		Concerning the consumption per equivalent adult, it can be seen that it depends positively and significantly on	
		aggregate crop productivity, the size of land, the size of	
		household, several wealth variables such as the lagged	
		value of the number of animals owned and the lagged	
		value of consumer durables, the age of the household	
		head (significant in Ruvuma), access to credit variables,	
		and some education variables.	
		The Durbin-Wu-Hausman test of the exogeneity of the	
		crop productivity strongly rejects the hypothesis of	
	1	crop productivity strongly rejects the hypothesis of	

			1
	exogeneity, so IV is appropriate. Table 6 presents the first		
	stage regressions for the IV estimates. We use as		
	instruments a variety of exogenous land characteristics,		
	as well as weather shock variables, and lagged dummies		
	for whether the farm household used fertilizer and		
	chemicals, as well as the lagged number of coffee and		
	cashew trees. The Sargan test does not invalidate the use		
	of these instruments.		
	It must be mentioned that in the consumption regressions		
	the IV regression coefficient of crop income per acre is		
	significantly larger in the IV regressions compared to the		
	OLS estimates (the OLS estimates for these coefficients		
	are 0.028 for Kilimanjaro and 0.174 for Ruvuma,		
	compared to 0.144 and 0.411 for the IV regressions in		
	table 5 for the two regions).		
	The consumption regressions explain about 47 and 51		
	percent of the variance of consumption in Kilimanjaro and		
	Ruvuma respectively. The regressions of the squared		
	residuals from the consumption regressions on the same		
	explanatory variables as the ones in the consumption		
	regressions (excluding the variables that are related to		
	covariate and idiosyncratic shocks) reveal that fewer of		
	the variables are significant. In Kilimanjaro the		
	dependency ratio, the value of the dwelling, the number		
	of small animals, and the membership in a social group		
	are significant, while in Ruvuma, the only two significant		
	variables are the dummies for whether the household		
	receives remittances and whether the household has easy		
	access to seasonal credit. The regressions explain a rather		
	small proportion of the error less than 10 percent in both		
	regions). This suggests that unexplained components of		
	consumption variability dominate any parts that maybe		
	due to structural household specific factors.		
	Tables 7 and 8 indicate the average vulnerability index in		
	Kilimanjaro and Ruvuma by district, along with the		
	proportions of the variance of consumption that are due		
	to covariate factors, the average consumption per capita		
	and the average headcount measures of poverty rates in		
L I	5 1 7		

both years of the survey. The first observation is that average vulnerability in Kilimanjaro is much lower than in Ruvuma (31 percent versus 60 percent). This is in line with the much larger poverty incidence in Ruvuma compared to Kilimanjaro that was indicated earlier (63.3		
percent versus 39.5 percent).		

Structured summary of operationalization – validity assessment						1.2 valid	1.	2. Feasible?	
Construct: idiosyncratic shocks					Appropriate	empirical	conclusion -		
Article: Sarris & Karfakis (2010)						rep?	Valid?		
<u>Criterion</u>	Assessment	Quoted text or Rationale for neg	Quoted text or Rationale for negative assessment						
Construct defined?	Yes	Chistiaensen and Subbarao (2005) included covariate as well as idiosyncratic shocks			Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell	
Data collection methods reported?	Yes	The analysis of the paper will be representative survey of 957 run villages done in the Kilimanjaro 2003, and a representative surv in 36 villages done in the Ruvum March 2004. The survey was rep [] The questionnaire was designed complete socio-economic chara with a particular emphasis on th variety of risks.	al hou region, ey of 8 a regio beated to inv cteristi	seholds in 45 , in November 92 rural households on in February- a year later estigate the ics of households	YES		YES	YES	
Reporting of indicators/questions used to operationalise construct?	Yes	Table 2: Percentage of househo shocks between 1999 and 2003, cash crop grower or not. Health Death Illness Climatic Drought Excessive rains				YES			

		Agricultural production Harvest loss Livestock loss Post harvest cereal loss Economic		
		Cash crop price shock Cereal price shock Unemployment Property Theft Fire/house destroyed Land loss		
Sampling strategies reported?	Yes	based on a representative survey of 957 rural households in 45 villages done in the Kilimanjaro region, in November 2003, and a representative survey of 892 rural households in 36 villages done in the Ruvuma region in February- March 2004. The survey was repeated a year later for each region and was designed to be representative of rural farm households, and among them of cash crop (coffee in Kilimanjaro, coffee, tobacco and cashew nuts in Ruvuma) as well as non-cash crop producing households. The survey was not designed to sample the large-scale public and private coffee estates but only smallholders.		
Sampling sizes reported?	Yes	The analysis of the paper will be based on a representative survey of 957 rural households in 45 villages done in the Kilimanjaro region, in November 2003, and a representative survey of 892 rural households in 36 villages done in the Ruvuma region in February- March 2004.		
Data analysis methods reported?	Yes	Table 5 exhibits the results of the (instrumental variable) regressions on consumption and the squared residuals of consumption as per equations (15) and (17). The key variable for the vulnerability analysis is the coefficient in the consumption regressions of crop income per acre. Concerning the consumption per equivalent adult, it can be seen that it depends positively and significantly on		

aggregate crop productivity, the size of land, the size of		
household, several wealth variables such as the lagged		
value of the number of animals owned and the lagged		
value of consumer durables, the age of the household		
head (significant in Ruvuma), access to credit variables,		
and some education variables.		
The Durbin-Wu-Hausman test of the exogeneity of the		
crop productivity strongly rejects the hypothesis of		
exogeneity, so IV is appropriate. Table 6 presents the first		
stage regressions for the IV estimates. We use as		
instruments a variety of exogenous land characteristics,		
as well as weather shock variables, and lagged dummies		
for whether the farm household used fertilizer and		
chemicals, as well as the lagged number of coffee and		
cashew trees. The Sargan test does not invalidate the use		
of these instruments.		
It must be mentioned that in the consumption regressions		
the IV regression coefficient of crop income per acre is		
significantly larger in the IV regressions compared to the		
OLS estimates (the OLS estimates for these coefficients		
are 0.028 for Kilimanjaro and 0.174 for Ruvuma,		
compared to 0.144 and 0.411 for the IV regressions in		
table 5 for the two regions).		
The consumption regressions explain about 47 and 51		
percent of the variance of consumption in Kilimanjaro and		
Ruvuma respectively. The regressions of the squared		
residuals from the consumption regressions on the same		
explanatory variables as the ones in the consumption		
regressions (excluding the variables that are related to		
covariate and idiosyncratic shocks) reveal that fewer of		
the variables are significant. In Kilimanjaro the		
dependency ratio, the value of the dwelling, the number		
of small animals, and the membership in a social group		
are significant, while in Ruvuma, the only two significant		
variables are the dummies for whether the household		
receives remittances and whether the household has easy		
access to seasonal credit. The regressions explain a rather		
small proportion of the error less than 10 percent in both		
		I

regions). This suggests that unexplained components of consumption variability dominate any parts that maybe due to structural household specific factors. Tables 7 and 8 indicate the average vulnerability index in Kilimanjaro and Ruvuma by district, along with the proportions of the variance of consumption that are due to covariate factors, the average consumption per capita and the average headcount measures of poverty rates in both years of the survey. The first observation is that average vulnerability in Kilimanjaro is much lower than in Ruvuma (31 percent versus 60 percent). This is in line with the much larger poverty incidence in Ruvuma compared to Kilimanjaro that was indicated earlier (63.3 percent versus 20 5 percent).		
percent versus 39.5 percent).		

Transparency Assessment Article s	ummary
Article	Sietz et al (2012)
Transparent operationalizations	Adaptive capacity; cluster pattern analysis; exposure; food security;
	sensitivity
Partially transparent	
Not transparent	

Structured summary	of operationaliz	ation – validity assessment	1.1 DCM	1.2 valid	1.	2. Feasible?
Construct: adaptive ca	apacity		Appropriate	empirical	conclusion -	
Article: Sietz et al (201	12)			rep?	Valid?	
Criterion	Assessment	Quoted text or Rationale for negative assessment				
Construct defined?	Yes	the adaptive capacity of smallholders (the term as used in this study encompasses the coping capacity) describes the ability to adjust to weather extremes, manage damages or explore alternative livelihood opportunities.	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell CAN'T TELL	Yes/ no/ can't tell
Data collection methods reported?	2ndary data	The ALTAGRO (2006) data base contains detailed quantitative information for 527 smallholder households collected through household questionnaires.	CAN'T TELL			
Reporting of indicators/questions used to operationalise construct?	Yes	Ten categories describe the smallholder households covering personal information about the family members (e.g. occupation, education level, age), production systems (e.g. crop and livestock assets, labour input, processing and commer- cialisation of produce), weather conditions, food reserves, income, some expenses and credits. [] The following data are taken from the ALTAGRO (2006) data base to indicate the mechanisms relevant in this study. As the first dimension, the harvest failure risk is indicated by the number of production zones used for crop and pasture cultivation. The indicator considers plains, hillsides and hills. The second dimension of the area con- straint is measured by the crop area as an		YES		

important pre- requisite for food production. The pasture		
area highly correlates to livestock keeping and is		
therefore reflected in the livestock measure. The third		
dimension, the livestock constraint, is characterised by		
the number and types of animals. To compare various		
animal species, we calculated standardised livestock units		
in relation to an improved cattle variety based on the		
livestock-specific metabolism (Kleiber 1961). Average		
livestock weights were estimated using 20 representative		
animals of each species in the study region. Since fodder		
production is an essential condition for livestock keeping,		
the respective indicator contains a reference to the area		
and productivity of pasture land. Furthermore, the		
productivity constraint as the fourth dimension is		
provided for the major food crops potatoes and quinua. It		
averages the household's productivity across species,		
varieties and production zones for each crop. Again, we		
concentrate on food crops since the productivity of		
pastures is already included in the livestock measure. The		
fifth dimension of education deprivation relates to the		
number of years that a household head attended school.		
School attendance is classified according to the four		
levels: no formal education, primary, secondary and		
higher edu- cation. Finally, the lack of alternative income		
as the sixth dimension is quantified by the sum of annual		
monetary income from local off-farm activities and		
remittances. People usually receive remittances from		
household		
495		
members who migrate for climate-independent labour,		
for example mining and commerce. Table 1 summarises		
the indicators used to assess vulnerability.		
[]		
Table 1 Indicators of households' sensitivity and		
adaptive capacity. The range of the area and livestock		
constraints as well as lack of alternative income is		
provided following winsorisation, see description in		
text. (Data source: ALTAGRO 2006)		

	1		1	1		
		Dimension of	Indicator	Range		
		sensitivity and				
		adaptive				
		capacity				
		Harvest failure	Number of	1–3		
		risk	production			
			zones used for			
			cultivation			
		Area	Crop area	0.1–1.3 ha/person ^a		
		constraint				
		Livestock	Livestock units	0.1–8.0 livestock		
		constraint		units/person		
		Productivity	Potato	0.1–10.0 t/ha		
		constraint	productivity	0.2–1.8 t/ha		
			Quinua			
			productivity			
		Education	Education level	1-4		
		deprivation	of household			
			head			
		Lack of	Local off-farm	0–2400		
		alternative	income and	Soles/year*person		
		income	remittances			
		a Average: 4 per	sons per househol	d		
Sampling strategies	Yes	The households w	vere randomly sele	ected in four areas		
reported?		across the admini	strative Region of	Puno reflecting		
		representative sm	nallholder live- liho	od conditions.		
Sampling sizes	Yes	527 smallholder h	nouseholds			
reported?						
Data analysis	Yes	In preparing the f	urther analysis, we	e adjusted data sets		
methods reported?		with only a few ex	xtreme values to ir	crease the influence		
		of these data sets	on the cluster par	titions. For example,		
				eight or fewer units of		
			households with			
				single outliers which		
			data distribution of			
				quately focus on the		
		majority of house	holds, we winsoris	ed the data sets, i.e.,		

replaced the outlying observations (4%) with the next		
available less extreme observation (Barnett and Lewis		
1994). This pro- cedure was applied to the area and		
livestock constraints as well as the alternative income. All		
indicators were then normalised to a 0–1 range using the		
minimum–maximum values. Prior to the cluster analysis,		
we determined correlations		
between the selected indicators and the variance		
distribu- tion in the data space. Firstly, the correlation		
coefficients reached average absolute values of 0.11. The		
crop area and livestock units correlate most strongly here		
(0.46) reflec- ting the mixed production systems.		
Furthermore, variables showing a large variance may be		
intuitively expected to contain most of the structure		
information. Therefore, we explored the variance of the		
selected indicators using a principal component analysis		
(PCA). The PCA was per- formed using the open source		
statistics package R (RDCT 2009) following standard		
procedure based on Pearson correlations.		

Structured sum	nary of ope	rationalization – validity assessment	1.1 DCM	1.2	1.	2.
Construct: cluste	er pattern a	nalysis	Appropri	valid	conclus	Feasibl
Article: Sietz et a	al (2012)		ate	empiri	ion -	e?
<u>Criterion</u>	Assessm ent	Quoted text or Rationale for negative assessment		cal rep?	Valid?	
Construct defined?	Yes	Without such a pre-selection, alternative approaches investigate the structure of the data space spanned by selected vulnerability indicators using cluster analysis. They deliver useful insights into recurrent indicator com- binations based on similarities among units of analysis, in cases where such a grouping exists. For example, clustering revealed typical livelihood strategies employed by small-holders in Mexico and Botswana (Eakin 2005; Sallu et al. 2010).	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell CAN'T TELL	Yes/ no/ can't tell
Data collection methods reported?	2ndary data	The ALTAGRO (2006) data base contains detailed quantitative information for 527 smallholder households collected through household questionnaires. []	CAN'T TELL			

		The necessary weather information is available in good quality for the 1996–2006		
		period for two stations located in Puno and Cabanillas (see Fig. 1). Table 2 shows the		
		average pre- cipitation and temperature for both stations.		
Reporting of	Yes	Ten categories describe the smallholder households covering personal information	CAN'T	
indicators/que		about the family members (e.g. occupation, education level, age), production systems	TELL	
stions used to		(e.g. crop and livestock assets, labour input, processing and commer- cialisation of		
operationalise		produce), weather conditions, food reserves, income, some expenses and credits.		
construct?		[]		
		The following data are taken from the ALTAGRO		
		(2006) data base to indicate the mechanisms relevant in this study. As the first		
		dimension, the harvest failure risk is indicated by the number of production zones used		
		for crop and pasture cultivation. The indicator considers plains, hillsides and hills. The		
		second dimension of the area con- straint is measured by the crop area as an important		
		pre- requisite for food production. The pasture area highly correlates to livestock		
		keeping and is therefore reflected in the livestock measure. The third dimension, the		
		livestock constraint, is characterised by the number and types of animals. To compare		
		various animal species, we calculated standardised livestock units in relation to an		
		improved cattle variety based on the livestock-specific metabolism (Kleiber 1961).		
		Average livestock weights were estimated using 20 representative animals of each		
		species in the study region. Since fodder production is an essential condition for		
		livestock keeping, the respective indicator contains a reference to the area and		
		productivity of pasture land. Furthermore, the productivity constraint as the fourth		
		dimension is provided for the major food crops potatoes and quinua. It averages the		
		household's productivity across species, varieties and production zones for each crop.		
		Again, we concentrate on food crops since the productivity of pastures is already		
		included in the livestock measure. The fifth dimension of education deprivation relates		
		to the number of years that a household head attended school. School attendance is		
		classified according to the four levels: no formal education, primary, secondary and		
		higher edu- cation. Finally, the lack of alternative income as the sixth dimension is		
		quantified by the sum of annual monetary income from local off-farm activities and		
		remittances. People usually receive remittances from household		
		495		
		members who migrate for climate-independent labour, for example mining and		
		commerce. Table 1 summarises the indicators used to assess vulnerability.		
		Table 1 Indicators of households' sensitivity and adaptive		
		capacity. The range of the area and livestock constraints		
		as well as lack of alternative income is provided following		

winsorisation, see ALTAGRO 2006)	e description in tex	t. (Data source	2:						
Dimension of sensitivity and adaptive capacity	Indicator	Range							
Harvest failure risk	Number of production zones used for cultivation	1–3							
Area constraint	Crop area	0.1–1.3 ha/p	oerson ^a						
Livestock constraint	Livestock units	0.1–8.0 lives units/persor							
Productivity constraint	Potato productivity Quinua productivity	0.1–10.0 t/h 0.2–1.8 t/ha							
Education deprivation	Education level of household head	1-4							
Lack of alternative income	Local off-farm income and remittances	0–2400 Soles/year*p	person						
	ons per household								
[] The necessary wear period for two stati average pre- cipitat [] Table 2 Mean pre stations (Data sou SENAMHI)	ther information is ions located in Pun	o and Cabanil ure for both st perature for 1 nal de Meteor	las (see Fig ations. 996–2006	g. 1). Tab at Puno	ole 2 s	hows Cabani	the llas		
		Na Ju Ju	Au Se	Oc	No	De	Tot		
3411	b r pr y		g pt	t	v	c	al		

		Precipitat ion (mm)															
		Puno	20 1	16 1	13 8	60	7	3	4	14	27	51	48	88	801		
		Cabanilla s	16 6	16 5	11 2	56	6	1	3	11	19	54	55	91	738		
		Mean temperat ure (🛛C)															
		Puno	10. 8	10. 7	10. 6	9. 7	8.1	6. 8	6. 8	7. 9	9.3	10. 4	11. 0	11. 5	9.5		
		Cabanilla s	10. 6	10. 5	10. 5	9. 8	8.6	7. 3	6. 9	8. 1	9.6	10. 6	11. 1	11. 3	9.6		
		Minimu m temperat ure (I2C)															
		Puno	5.7	5.8	5.4	3. 8	0.8	- 0. 9	- 1. 1	0. 4	1.9	3.6	4.3	5.4	2.9		
		Cabanilla s	5.3	5.5	5.2	3. 7	1.1	- 0. 8	- 1. 5	0. 3	2.1	3.7	4.2	5.1	2.8		
Sampling strategies reported?	2ndary data																
Sampling sizes reported?	2ndary data																
Data analysis methods reported?	Yes	The cluster a exchange alg 1967; RDCT of partitions detects stab categorised measure". T the consiste	gorith 2009) for a le or u in the he hig	m, i.e. . Base pre-gi Instab same sher th	, hclus d on s ven nu le (ina cluste nis me	st and tocha umbe approper in tr asure	kmea stic in r of clu priate) wo pai	ns, us itialis usters part part rtition	sing t ation to d itions ns is e reliab	he sta , we c eterm s. The expres	atistics alcula nine w share ssed as e cluste	packa ted th hether of hou s "con er resu	age R (e repr the a usehol sisten ults. W	MacQ oducil Igorith ds tha cy /e calc	ueen bility nm t were ulated		

a given number of clusters. Ultimately, the consistency measure enables us to identify the optimal number of clusters to be analysed. Further methodological details are		
outlined in a previous application of the cluster approach to dryland vulnerability on a global scale (Sietz et al. 2011).		

Structured sum	mary of ope	rationalizatio	n – va	lidity	assess	ment	t									1.1 DCM	1.2	1.	2.
Construct: Expo	sure															Appropri	valid	conclus	Feasibl
Article: Sietz et a	al (2012)															ate	empiri	ion -	e?
<u>Criterion</u>	<u>Assessm</u> <u>ent</u>	Quoted text	or Ra	tional	e for n	egati	ve ass	essm	<u>ent</u>								cal rep?	Valid?	
Construct defined?	Yes	expo- sure, s	sensiti	vity aı	nd cop	oing/a	daptiv	ve cap	oacity	ı (IPCC	2007).				Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell
Data collection methods reported?	2ndary data	The necessa period for tw average pre-	vo sta	tions l	ocate	d in P	uno ai	nd Ca	banil	las (se	ee Fig.					YES		YESS	YES, WHEN
Reporting of indicators/que stions used to operationalise construct?	2ndary data	The necessa period for tw average pre [] Table 2 Me stations (D SENAMHI)	vo sta - cipita ean pri ata so	tions l ation a ecipita urce:	locate and te ation a Servic	d in P mpera ind te io Nac	uno al ature f	nd Ca for bo ature de M	banil oth st for 1	las (se ation: 996–2	ee Fig. s. 2006 a	1). Ta t Puno	ble 2 s	shows	the illas		YES		DATA IS AVAILA BLE
		Precipita tion (mm) Puno	Jan 20	Fe b 16	M ar 13	A pr 60	Ma y 7	Ju n 3	Ju I 4	Au g 14	Se pt 27	Oc t 51	No v 48	De c 88	Tot al 801				
		Cabanilla s	1 16 6	1 16 5	8 11 2	56	6	1	3	11	19	54	55	91	738				

	T		1			1	1	1	1		1			1	<u>г г</u>		r
		Mean															
		temperat															
		ure (IC)															
		Puno	10.	10.	10.	9.	8.1	6.	6.	7.	9.3	10.	11.	11.	9.5		
			8	7	6	7		8	8	9		4	0	5			
		Cabanilla	10.	10.	10.	9.	8.6	7.	6.	8.	9.6	10.	11.	11.	9.6		
		S	6	5	5	8		3	9	1		6	1	3			
		Minimu															
		m															
		temperat															
		ure (IPC)															
		Puno	5.7	5.8	5.4	3.	0.8	-	-	0.	1.9	3.6	4.3	5.4	2.9		
						8		0.	1.	4							
								9	1								
		Cabanilla	5.3	5.5	5.2	3.	1.1	-	-	0.	2.1	3.7	4.2	5.1	2.8		
		S				7		0.	1.	3							
								8	5								
Sampling	2ndary																
strategies	data																
reported?																	
Sampling sizes	2ndary																
reported?	data																
Data analysis	Yes	To make the	e two s	tation	is com	paral	ble, we	e dete	ermin	ed re	lative	anoma	alies c	ompa	red to		
methods		the average															
reported?		ranking. This	s ranki	ng wa	s ther	n used	d to ide	entify	dries	st and	wette	est per	iods v	vhich			
		caused prod		-				-				-			ation		
		events to so			-						-	-	-	-			
		window. Thi						-		-				-	days).		
		This choice i						-		-	-			-			
		Covering the			-												
		precipitation													still		
		allows for su				-							0				
		[]															
		In conclusion	n. clim	ate ex	เกดรมเ	e wa	s preci	nitati	on-d	riven							
		during the re			-		-	-			tempe	rature	cond	itions	at		
		both station					-	-			-				~ ~		
		Therefore, a								-					dered		
		mereiore, a	poter	ונומו א	Jatial	variat		the e	vhos	uie ul	Jes nu	t nave		COUS	uereu		

		in the further vulnerability analysis.				
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Structured summary	of operational	ization – validity assessment	1.1 DCM	1.2 valid	1.	2.
Construct: food secur	ity		Appropriate	empirical	conclusion	Feasible?
Article: Sietz et al (20)	12)			rep?	- Valid?	
<u>Criterion</u>	Assessment	Quoted text or Rationale for negative assessment				
Construct defined?	Yes	Food security is often discussed in terms of four	Yes/ no/	Yes/ no/	Yes/ no/	Yes/ no/
		dimensions: food availability, access, stability of supply/ access and	can't tell	can't tell	can't tell	can't tell
		utilisation (FAO 2000).			YES	
Data collection	Yes	Therefore, we conducted a Household Validation Survey (HVS) in	YES			YES
methods reported?		collaboration with CIRNMA technicians.				
Reporting of	Yes	We collected data on the purchase of food and fodder in 2005/2006		YES		
indicators/questions		including monetary and in-kind exchange. The purchase was				
used to		considered in relation to an average year to compare households in a				
operationalise		standardised way. The average year indicates the necessary purchase				
construct?		which complements the household's production and reserves to				
		maintain the average nutritional status. We assume that changes in				
		2005/2006 were primarily caused by the iden-tified weather				
		extremes given that the productive resources and agricultural				
		management are relatively stable over time. As smallholders do not				
		maintain records of their pur-				
		chase, the data collection drew on their memory recall. This				
		approach provides good estimates in the absence of other reliable				
		data sources, though some limitations need to be considered. Most				
		importantly, this method does not account for memory biases. To				
		reduce such biases, the survey referred to the purchase of a specific				
		crop in a given year. Firstly, smallholders were asked to reflect on				
		thecroptheyharvested last, starting with the previous campaign and				
		successively moving backwards to the 2005/2006 campaign. This part				
		of the survey was con- ducted with the aid of an abacus. Starting				
		with the given number of 10 beads indicating the average purchase,				
		household heads or other adult family members removed or added				
		beads to quantify their relative purchase in 2005/2006. The survey				
		considered the five major food and fodder crops: potatoes, quinua,				
		broad beans, barley and oat. The second part of the HVS focused on				

		information about aspects of the smallholder livelihoods that help explain important causes for differences in purchase to support the interpretation and validation of the vulnera- bility clusters. This part involved semi-structured inter- views exploring effects of weather extremes on the smallholders' livelihoods, access to land, production zones and income, availability of labour as well as social and		
		economic opportunities to cope with production failure. Overall, each interview took around 45 min and was car- ried out in Spanish or Quechua according to the native language of the interviewees.		
Sampling strategies reported?	Yes	It was carried out in 33 ran- domly chosen households (12%) in February 2009. The engagement of local smallholders is a key component of this study. They are considered a necessary information source for providing details on the local conditions of climate sensitivity as well as constraints and opportunities for coping with adverse effects.		
Sampling sizes reported?	Yes	It was carried out in 33 ran- domly chosen households (12%) in February 2009.		
Data analysis methods reported?	Yes	Recognising the sensitivity of any vulnerability analysis to the choice of indicators, we empirically examine whe- ther the formal entities provide specific evidence about damages under the identified climate exposure. For this, the data on households' purchase collected in the HVS are related to the cluster membership of households. Figure 4 shows that each cluster corresponds to a relatively small range of the damage measure. Therefore, the similarities among the households revealed by the cluster analysis hold true with regard to the outcomes of the climate exposure.		

Structured summary of	of operationaliz	ation – validity assessment	1.1 DCM	1.2 valid	1.	2. Feasible?
Construct: Sensitivity			Appropriate	empirical	conclusion -	
Article: Sietz et al (201	L2)			rep?	Valid?	
<u>Criterion</u>	Assessment	Quoted text or Rationale for negative assessment				
Construct defined?	Yes	We consider the effects of weather disturbance on the	Yes/ no/ can't	Yes/ no/	Yes/ no/	Yes/ no/
		agricultural systems as sensitivity.	tell	can't tell	can't tell	can't tell
Data collection	2ndary data	The ALTAGRO (2006) data base contains detailed	YES		CAN'T TELL	

methods reported?		quantitative information for 527 smallholder households collected through household questionnaires.		
Deporting of	Yes		CAN'T TELL	
Reporting of	res	Ten categories describe the smallholder households	CANTIELL	
indicators/questions		covering personal information about the family members		
used to		(e.g. occupation, education level, age), production		
operationalise		systems (e.g. crop and livestock assets, labour input,		
construct?		processing and commer- cialisation of produce), weather		
		conditions, food reserves, income, some expenses and		
		credits.		
		[]		
		The following data are taken from the ALTAGRO		
		(2006) data base to indicate the mechanisms relevant in		
		this study. As the first dimension, the harvest failure risk		
		is indicated by the number of production zones used for		
		crop and pasture cultivation. The indicator considers		
		plains, hillsides and hills. The second dimension of the		
		area con- straint is measured by the crop area as an		
		important pre- requisite for food production. The pasture		
		area highly correlates to livestock keeping and is		
		therefore reflected in the livestock measure. The third		
		dimension, the livestock constraint, is characterised by		
		the number and types of animals. To compare various		
		animal species, we calculated standardised livestock units		
		in relation to an improved cattle variety based on the		
		livestock-specific metabolism (Kleiber 1961). Average		
		livestock weights were estimated using 20 representative		
		animals of each species in the study region. Since fodder		
		production is an essential condition for livestock keeping,		
		the respective indicator contains a reference to the area		
		and productivity of pasture land. Furthermore, the		
		productivity constraint as the fourth dimension is		
		provided for the major food crops potatoes and quinua. It		
		averages the household's productivity across species,		
		varieties and production zones for each crop. Again, we		
		concentrate on food crops since the productivity of		
		pastures is already included in the livestock measure. The		
		fifth dimension of education deprivation relates to the		
		number of years that a household head attended school.		
	1	number of years that a nousehola head attended school.	1	I

 			-					
	e is classified acco	-						
	education, primary							
_		of alternative income						
as the sixth dime	nsion is quantified	by the sum of annual						
monetary income	e from local off-far	m activities and						
remittances. Peo	ple usually receive	remittances from						
household								
495								
members who m	igrate for climate-i	ndependent labour,						
for example mini	ng and commerce.	Table 1 summarises						
	ed to assess vulner							
[]								
	ors of households' s	sensitivity and						
		e area and livestock						
	ell as lack of alterr							
	ing winsorisation,							
	ce: ALTAGRO 2006							
Dimension of	Indicator	Range	l					
sensitivity and	malcutor	nunge	l					
adaptive			ł					
-			l					
capacity			l					
Harvest failure	Number of	1–3	l					
		1-5	l					
risk	production		l					
	zones used for							
	cultivation							
Area	Crop area	0.1–1.3 ha/person ^a	1					
constraint			$\left \right $					
Livestock	Livestock units	0.1–8.0 livestock	i I					
constraint		units/person						
Productivity	Potato	0.1–10.0 t/ha						
constraint	productivity	0.2–1.8 t/ha	11					
	Quinua							
	productivity		i I					
Education	Education level	1–4	ł					
deprivation	of household							
	head							
Lack of	Local off-farm	0–2400						
-400			1					

		alternative	income and	Soles/year*person	
		income	remittances		
		a Average: 4 pe	rsons per househo	old	
Sampling strategies	Yes	The households v	vere randomly sel	ected in four areas	
reported?		across the admin	istrative Region of	Puno reflecting	
		· · ·	nallholder live- lih	ood conditions.	
Sampling sizes	Yes	527 smallholder	nouseholds		
reported?					
Data analysis	Yes		• •	e adjusted data sets	
methods reported?				ncrease the influence	
				rtitions. For example,	
			-	eight or fewer units of	
				up to 39 livestock	
			• •	s single outliers which	
				of this indicator. To	
				equately focus on the	
				sed the data sets, i.e.,	
				(4%) with the next	
				(Barnett and Lewis	
			edure was applied		
				alternative income. All	
		indicators were t	hen normalised to	a 0–1 range using the	
		minimum–maxin	ium values. Prior t	to the cluster analysis,	
		we determined c			
		between the sele	cted indicators an	d the variance	
				stly, the correlation	
			-	ute values of 0.11. The	
		crop area and live	estock units correl	ate most strongly here	
		(0.46) reflec- ting	the mixed produc	ction systems.	
		Furthermore, var	iables showing a l	arge variance may be	
		intuitively expect	ed to contain mos	st of the structure	
		information. The	refore, we explore	ed the variance of the	
		selected indicato	rs using a principa	l component analysis	
		(PCA). The PCA w	as per- formed us	ing the open source	
		statistics package	R (RDCT 2009) fo	llowing standard	
		procedure based	on Pearson correl	ations.	

Transparency Assessment Article summary					
Article	Tesso et al (2012)				
Transparent operationalizations	Determinants of resilience; household level resilience				
Partially transparent					
Not transparent					

Structured summary	of operationali	zation – validity assessment	1.1 DCM	1.2 valid	1.	2. Feasible?
Construct: Determina	nts of resilience	2	Appropriate	empirical	conclusion -	
Article: Tesso et al (20	012)			rep?	Valid?	
<u>Criterion</u>	<u>Assessment</u>	Quoted text or Rationale for negative assessment				
Construct defined?	Yes	important determinants for resilience at household level in North Shewa zone of Ethiopia.	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell
Data collection methods reported?	Yes	The data for the research was obtained from a survey of 452 farm households in three districts of the Zone in 2011/2012. [] A structured ques- tionnaire was used to interview the farmers. [] In addition, secondary data relevant for this analysis was obtained from the National Meteorological Service Agency (NMSA), Central Statistical Authority (CSA), and Zonal and district agricultural offices. In order to understand the research questions at community level, qualitative data were collected through focused group discussion using checklist prepared for the purpose.	YESS		YES	YES
Reporting of indicators/questions used to operationalise construct?	Yes	Data col- lected from the farmers include household character- istics, landholding, crops and livestock production, dis- aster occurrence, perception level (on precipitation, tem- perature, soil moisture, air moisture and wind direction), adaptation strategies pursued, different coping strategies pursued, level of resilience, and other		YES		

I		
	relevant informa- tion.	
	[<u>[]</u>	
	Table 1. Social, economic and environmental	
	vulnerability indicators for the study area.	
	I. Social Vulnerability Variables	
	Sex: Female headed	
	Education: illiterate and less than grade 2	
	Marital status: Single (including divorce and widow)	
	No. of relatives: relative to less than 5 households	
	No. institutions: Participation in less than 2.35	
	institutions	
	Dependency: High dependency of 4 person and more	
	Farm to farm ext: No access to farmer to farmer	
	extension	
	Year Ag. Experience: Lack of farm experience if < 3 years	
	Access to indigenous early warning information: Having	
	no access	
	II. Economic Vulnerability Variables	
	Livestock ownership: Own less than 2 tropical livestock	
	Access to information: Having no access to	
	Ownership of perennial crops: no area under perennial	
	crops	
	Land size: own less than 0.5ha of land	
	Land fragmentation: own only one plots	
	Non-farm income: Have no non-farm income	
	Soil and water conservation structures: More than 50% is	
	not conserved	
	Income level: Having less than minimum requirement	
	Consumption expenditure: Spending less than minimum	
	requirement	
	Crop diversity: less than 50% of the 8 major crops grown	
	in the area	
	Land under irrigation: no access to irrigation at all	
	Land under improved seed: area not covered with	
	improved seed (average of high yielding, drought	
	Limproved seed (average of high yierding, drought	

		tolerant, early maturing) Land under commercial fertilizer: Having no access to fertilizer at all Cash reserve: Having no cash saving at all Food reserve: Having no food reserve for next year Credit: Having no access to credit at all III. Environmental Vulnerability Variables (Measures of Sensitivity and Exposure)		
		Land topography: Slope greater than 15% and 0% slope Fertility: Poor fertility and cannot produce without heavy fertilizer use Vegetation cover: Bare land Frequency of hazards: People facing more than two natural hazards in a year Rainfall: Receiving below average Temperature: Experiencing above average Change in wind direction: Encountering change in wind direction than usual		
Sampling strategies reported?	Yes	The specific study sites within the dis- tricts were selected based on a multi stage random sam- pling procedure. Consequently, 19 Kebeles were selected from which the sample households were selected ran- domly proportional to population size.		
Sampling sizes reported?	Yes	452 farm households in three districts of the Zone		
Data analysis methods reported?	Yes	Ordered probit regression model was used to iden- tify and analyze the determinants of households' re- silience to climate change induced shocks.[] comparison was done based on certain defined characteristics. Thus, resilience in this measurment involved ordered out- come. This is with the basic hypothesis that a given natural shock will have differencial impact on house- holds' resilience. $Y_j^* = X_j^1B + U_{1j}$		

- *	 	
$Y = 0$ if $Y^* < 0$		
$Y = 1$ if $0 < Y^* < 1$		
Y = 2 if 1 < Y [*] _< 2		
Y* is level of resilience and involves ordered outcome, that		
is Y = 0 was given to households taking more than two years		
to bounce back, Y = 1 was given households taking greater		
than one year and less than or equals to two years; and Y =		
2, was given to households taking less than or equals to one		
year. The Xij are the explanatory variables determining the		
time taken to bounce back. The independent variables		
included in the model were avail- ability of food		
stock(dummy), income diversification (number of		
enterprises), number of plots, number of de- pendent		
family members, age of household head (years), access to		
credit (dummy), social capital (number of in- stitutional		
involvement), area under perennial crops (ha),		
preparedness (dummy), propensity to invest on natural		
resources (percentage of area under conservation), pro-		
pensity to save (percentage of saving), access to irriga- tion		
(ha), geographic locations (dummy), etc. βs are pa-		
rameters estimated and Uij is the disturbance term.		

Structured summary of operationalization – validity assessment			1.1 DCM	1.2 valid	1.	2. Feasible?
Construct: household	Construct: household level resilience Article: Tesso et al (2012)			empirical	conclusion -	
Article: Tesso et al (20				rep?	Valid?	
<u>Criterion</u>	<u>Assessment</u>	Quoted text or Rationale for negative assessment				
Construct defined?	Yes	According to DFID, resilience at community level is explained as the ability of countries, communities and households to manage change, by maintaining or transforming living standards in the face of shocks or stresses—such as earthquakes, drought or violent conflict— without compromising their long- term prospects [10]. Similarly, resilience is the ability of a social or ecological system to absorb disturbances while retaining the same basic structure and ways of functioning, the capacity for	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell YES	Yes/ no/ can't tell

		self-organization, and the capacity to adapt to stress and change. This is a measurement of community's capacity to absorb external shocks. In the aftermath of occurrence of climate change induced shocks, how do farmer bounce back to normal livelihood is about the resilience level of farming com- munity. A resilient community is able to respond to changes or stress in a positive way, and is able to maintain its core functions as a community despite those			
Data collection methods reported?	Yes	stresses [11].The data for the research was obtained from a survey of452 farm households in three districts of the Zone in2011/2012.[]A structured ques- tionnaire was used to interview thefarmers.[]In addition, secondary data relevant for this analysiswas obtained from the National Meteorological ServiceAgency (NMSA), Central Statistical Authority (CSA), andZonal and district agricultural offices.In order to understand the research questions atcommunity level, qualitative data were collected throughfocused group discussion using checklist prepared for thepurpose.	YES		
Reporting of indicators/questions used to operationalise construct?	Yes	Data collected from the farmers include household characteristics, landholding, crops and livestock production, disaster occurrence, perception level (on precipitation, temperature, soil moisture, air moisture and wind direction), adaptation strategies pursued, different coping strategies pursued, level of resilience, and other relevant informa- tion. [] Table 1. Social, economic and environmental vulnerability indicators for the study area. I. Social Vulnerability Variables Sex: Female headed Education: illiterate and less than grade 2		YES	

Marital status: Single (including divorce and widow)	
No. of relatives: relative to less than 5 households	
No. institutions: Participation in less than 2.35	
institutions	
Dependency: High dependency of 4 person and more	
Farm to farm ext: No access to farmer to farmer	
extension	
Year Ag. Experience: Lack of farm experience if < 3 years	
Access to indigenous early warning information: Having	
no access	
II. Economic Vulnerability Variables	
······································	
Livestock ownership: Own less than 2 tropical livestock	
unit	
Access to information: Having no access to	
Ownership of perennial crops: no area under perennial	
crops	
Land size: own less than 0.5ha of land	
Land fragmentation: own only one plots	
Non-farm income: Have no non-farm income	
Soil and water conservation structures: More than 50% is	
not conserved	
Income level: Having less than minimum requirement	
Consumption expenditure: Spending less than minimum	
requirement	
Crop diversity: less than 50% of the 8 major crops grown	
in the area	
Land under irrigation: no access to irrigation at all	
Land under improved seed: area not covered with	
improved seed (average of high yielding, drought	
tolerant, early maturing)	
Land under commercial fertilizer: Having no access to	
fertilizer at all	
Cash reserve: Having no cash saving at all	
Food reserve: Having no food reserve for next year	
Credit: Having no access to credit at all	
III. Environmental Vulnerability Variables (Measures of	
Sensitivity and Exposure)	

		Land topography: Slope greater than 15% and 0% slope Fertility: Poor fertility and cannot produce without heavy fertilizer use Vegetation cover: Bare land Frequency of hazards: People facing more than two natural hazards in a year Rainfall: Receiving below average Temperature: Experiencing above average Change in wind direction: Encountering change in wind direction than usual	
Sampling strategies reported?	Yes	The specific study sites within the dis- tricts were selected based on a multi stage random sam- pling procedure. Consequently, 19 Kebeles were selected from which the sample households were selected ran- domly proportional to population size.	
Sampling sizes reported?	Yes	452 farm households in three districts of the Zone	
Data analysis methods reported?	Yes	In this analysis, the level of resilience was classified into three categories: 1) households that were fast in bouncing back; which means households that have gone back to their normal agricultural operation in the following production season; 2) moderate in bouncing back; which means households which took one to two agricultural seasons to get back to normal operation as before the event; and 3) slow in bouncing back; which means households which were unable to bounce back within one to two agricultural seasons to their normal livelihood activities. In this research, a farmer is said to have fully bounced back, when it begins its lively- hood operation as time before the shock. The speed of bouncing back was measured by number of agricul- tural seasons taken to bounce back to their livelihood without external intervention by government or non- governmental organization. [] Table 3 presents the statistical measure of the different	

Transparency Assessment Article summary						
Article	Westerhoff & Smit (2009)					
Transparent operationalizations	Adaptation strategy; adaptive capacity; exposed and sensitive to climate change; multiple underlying forces					
Partially transparent						
Not transparent						

Structured summary of operationalization – validity assessment			1.1 DCM	1.2 valid empirical	1. conclusion -	2. Feasible?
Construct: adaptation	Construct: adaptation strategy					
Article: Westerhoff & Smit (2009)				rep?	Valid?	
<u>Criterion</u>	Assessment	Quoted text or Rationale for negative assessment				
Construct defined?	Yes	Adaptations, or adaptive strategies, employed by individuals or groups are depicted as being mediated through their relative adaptive capacities, indicating that adaptations may or may not be accessed according to the distribution of various types of resources such as physical or social capital, as developed by Adger and Kelly (1999).	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell YES	Yes/ no/ can't tell YES
Data collection methods reported?	Yes	These were determined using a community-based approach similar to those used by Burton et al. (2002), Ford and Smit (2004) and Schröter et al. (2005), in which the factors and forces relevant to the community vulnerability were sought via primary and secondary sources. [] Most of the primary data were derived from 22 semi- structured, in-depth interviews with 11 male and 11 female community members, [] These community-member interviews were complemented by an additional 22 in-depth interviews with key informants from various governmental and non-governmental institutions in the area [] In addition, five focus groups were conducted with members	YES			

		of the community, [] The community-based data collection was complemented by a review of documents and records to extract information on the biophysical and socioeconomic forces contributing to vulnerability. Documents comprised existing studies completed in the area, government reports, climate data, and all other pertinent information.		
Reporting of indicators/questions used to operationalise construct?	Yes	 22 semi-structured, in-depth interviews with 11 male and 11 female community members, who were asked to describe and explain in local terminology the various exposure-sensitivities, adaptations and adaptive capacities of importance to them. [] interviews with key informants from various governmental and non-governmental institutions in the area for the purposes of obtaining further information on the relevant contributing biophysical/socioeconomic forces, exposure-sensitivities, adaptations, and adaptive capac- ities in Mimkyemfre. [] five focus groups were conducted with members of the community, through which data on the experience of vulnerability by residents engaged in primary livelihood activities were gathered. Information on methods of farming, charcoal production and fishing, the stresses on these livelihoods, and the means for overcoming these stresses was compiled. Focus groups were used to investigate interactions between community members and other aspects of vulnerability that became evident in the group dynamic, an effect often referred to as 'synergism' (Morgan 1996). 	YES	
Sampling strategies reported?	Yes	Interviewees were selected using purposeful and "typical case" sampling methods in order to obtain an illustrative sample of gender and age groups (Bradshaw and Stratford 2000). Members of the community who were engaged in farming or other commonly- practiced activities were included, as were typically marginalized groups such as		

		 women and the elderly, to gain insight on different experiences within the community. [] Key informant interviewees were selected based on their expertise on and/or experience with the community and its environment, and ranged from community members to members of relevant institutions, including local NGOs, the Ministry of Food and Agriculture, the National Health Insurance Scheme, the Department of Forestry and several others. [] Participants for focus groups were selected primarily using a combination of purposeful and typical case sampling methods in order to identify members that were representative of the community so as to ensure a typical characterization of the community was obtained. 		
Sampling sizes reported?	Yes	 22 semi-structured, in-depth interviews with 11 male and 11 female [] 22 in-depth interviews with key informants [] five focus groups 		
Data analysis methods reported?	Yes	Data from these multiple sources were coded, sorted and analyzed (in part using qualitative data analysis software) according to the themes of the conceptual model of vulnerability in order to identify relevant forces, exposure- sensitivities, adaptations and adaptive capacities experienced at the individual, household and community levels.		

Structured summary of operationalization – validity assessment			1.1 DCM	1.2 valid	1.	2. Feasible?
Construct: Adaptive capacity			Appropriate	empirical	conclusion -	
Article: Westerhoff & Smit (2009)				rep?	Valid?	
<u>Criterion</u>	<u>Assessment</u>	Quoted text or Rationale for negative assessment				
Construct defined?	Yes	Adaptive capacity (broadly consistent with social	Yes/ no/ can't	Yes/ no/	Yes/ no/	Yes/ no/

		resilience) is also reflective of both the natural resource base and the social, economic, cultural and political	tell	can't tell	can't tell	can't tell
		conditions that facilitate or constrain adaptations to			YES	YES
		changing environments.			125	125
Data collection	Yes	These were determined using a community-based	YES			
methods reported?		approach similar to those used by Burton et al. (2002),				
		Ford and Smit (2004) and Schröter et al. (2005), in which				
		the factors and forces relevant to the community				
		vulnerability were sought via primary and secondary				
		sources.				
		[]				
		Most of the primary data were derived from 22 semi-				
		structured, in-depth interviews with 11 male and 11				
		female community members,				
		[]				
		These community-member interviews were				
		complemented by an additional 22 in-depth interviews				
		with key informants from various governmental and non-				
		governmental institutions in the area []				
		In addition, five focus groups were conducted with				
		members of the community,				
		[]				
		The community-based data collection was complemented				
		by a review of documents and records to extract				
		information on the biophysical and socioeconomic forces				
		contributing to vulnerability. Documents comprised				
		existing studies completed in the area, government				
		reports, climate data, and all other pertinent information.				
Reporting of	Yes	22 semi-structured, in-depth interviews with 11 male and		YES		
indicators/questions		11 female community members, who were asked to				
used to		describe and explain in local terminology the various				
operationalise		exposure-sensitivities, adaptations and adaptive				
construct?		capacities of importance to them.				
		[]				
		interviews with key informants from various				
		governmental and non-governmental institutions in the				
		area for the purposes of obtaining further information on				

	1			
		the relevant contributing biophysical/socioeconomic		
		forces, exposure-sensitivities, adaptations, and adaptive		
		capac- ities in Mimkyemfre.		
		[]		
		five focus groups were conducted with members of the		
		community, through		
		which data on the experience of vulnerability by residents		
		engaged in primary livelihood activities were gathered.		
		Information on methods of farming, charcoal production		
		and fishing, the stresses on these livelihoods, and the		
		means for overcoming these stresses was compiled. Focus		
		groups were used to investigate interactions between		
		community members and other aspects of vulnerability		
		that became evident in the group dynamic, an effect		
		often referred to as 'synergism' (Morgan 1996).		
Sampling strategies	Yes	Interviewees were selected using purposeful and "typical		
reported?	100	case" sampling methods in order to obtain an illustrative		
reporteu.		sample of gender and age groups (Bradshaw and		
		Stratford 2000). Members of the community who were		
		engaged in farming or other commonly- practiced		
		activities were included, as were typically marginalized		
		groups such as women and the elderly, to gain insight on		
		different experiences within the community.		
		[]		
		Key informant interviewees were selected based on their		
		expertise on and/or experience with the community and		
		its environment, and ranged from community members		
		to members of relevant institutions, including local NGOs,		
		_		
		the Ministry of Food and Agriculture, the National Health		
		Insurance Scheme, the Department of Forestry and		
		several others.		
		Participants for focus groups were selected primarily		
		using a combination of purposeful and typical case		
		sampling methods in order to identify members that were		
		representative of the community so as to ensure a typical		
		characterization of the community was obtained.		

Sampling sizes reported?	Yes	 22 semi-structured, in-depth interviews with 11 male and 11 female [] 22 in-depth interviews with key informants [] five focus groups 		
Data analysis methods reported?	Yes	Data from these multiple sources were coded, sorted and analyzed (in part using qualitative data analysis software) according to the themes of the conceptual model of vulnerability in order to identify relevant forces, exposure-sensitivities, adaptations and adaptive capacities experienced at the individual, household and community levels.		

Structured summary	tructured summary of operationalization – validity assessment			1.2 valid	1.	2. Feasible?
Construct: exposed a	nd sensitive to c	limate change	Appropriate	empirical	conclusion -	
Article: Westerhoff &	Smit (2009)			rep?	Valid?	
<u>Criterion</u>	Assessment	Quoted text or Rationale for negative assessment				
Construct defined?	Yes	People's exposures and sensitivities to external conditions are influenced by their occupancy and livelihood characteristics, and the nature and degree to which these are affected by the external stresses.	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell YES	Yes/ no/ can't tell YES
Data collection methods reported?	Yes	These were determined using a community-based approach similar to those used by Burton et al. (2002), Ford and Smit (2004) and Schröter et al. (2005), in which the factors and forces relevant to the community vulnerability were sought via primary and secondary sources. [] Most of the primary data were derived from 22 semi- structured, in-depth interviews with 11 male and 11 female community members, [] These community-member interviews were complemented by an additional 22 in-depth interviews	YES			

		 with key informants from various governmental and non-governmental institutions in the area [] In addition, five focus groups were conducted with members of the community, [] The community-based data collection was complemented by a review of documents and records to extract information on the biophysical and socioeconomic forces contributing to vulnerability. Documents comprised existing studies completed in the area, government reports, climate data, and all other pertinent information. 		
Reporting of indicators/questions used to operationalise construct?	Yes	22 semi-structured, in-depth interviews with 11 male and 11 female community members, who were asked to describe and explain in local terminology the various exposure-sensitivities, adaptations and adaptive capacities of importance to them. [] interviews with key informants from various governmental and non-governmental institutions in the area for the purposes of obtaining further information on the relevant contributing biophysical/socioeconomic forces, exposure-sensitivities, adaptations, and adaptive capac- ities in Mimkyemfre. [] five focus groups were conducted with members of the community, through which data on the experience of vulnerability by residents engaged in primary livelihood activities were gathered. Information on methods of farming, charcoal production and fishing, the stresses on these livelihoods, and the means for overcoming these stresses was compiled. Focus groups were used to investigate interactions between community members and other aspects of vulnerability that became evident in the group dynamic, an effect often referred to as 'synergism' (Morgan 1996).	YES	
Sampling strategies reported?	Yes	Interviewees were selected using purposeful and "typical case" sampling methods in order to obtain an illustrative		

		sample of gender and age groups (Bradshaw and Stratford 2000). Members of the community who were engaged in farming or other commonly- practiced activities were included, as were typically marginalized groups such as women and the elderly, to gain insight on different experiences within the community. [] Key informant interviewees were selected based on their expertise on and/or experience with the community and its environment, and ranged from community members to members of relevant institutions, including local NGOs, the Ministry of Food and Agriculture, the National Health Insurance Scheme, the Department of Forestry and several others. [] Participants for focus groups were selected primarily using a combination of purposeful and typical case sampling methods in order to identify members that were representative of the community so as to ensure a typical		
Sampling sizes reported?	Yes	 22 semi-structured, in-depth interviews with 11 male and 11 female [] 22 in-depth interviews with key informants [] five focus groups 		
Data analysis methods reported?	Yes	Data from these multiple sources were coded, sorted and analyzed (in part using qualitative data analysis software) according to the themes of the conceptual model of vulnerability in order to identify relevant forces, exposure-sensitivities, adaptations and adaptive capacities experienced at the individual, household and community levels.		

Structured summary	Structured summary of operationalization – validity assessment			1.2 valid	1.	2. Feasible
Construct: multiple ur			Appropriate	empirical	conclusion -	
Article: Westerhoff &	Smit (2009)			rep?	Valid?	
<u>Criterion</u>	Assessment	Quoted text or Rationale for negative assessment	tell			
Construct defined?	Yes	n summary, research on practical adaptations to effectively address the vulnerability of people to climate change has recognized the need to identify the factors in addition to climate that contribute to vulnerability, including the multiple forces and dynamic processes that occur at both local and broader scales.	Yes/ no/ can't tell	Yes/ no/ can't tell	Yes/ no/ can't tell YES	Yes/ no/ can't tell
Data collection methods reported?	Yes	These were determined using a community-based approach similar to those used by Burton et al. (2002), Ford and Smit (2004) and Schröter et al. (2005), in which the factors and forces relevant to the community vulnerability were sought via primary and secondary sources. [] Most of the primary data were derived from 22 semi- structured, in-depth interviews with 11 male and 11 female community members, [] These community-member interviews were complemented by an additional 22 in-depth interviews with key informants from various governmental and non- governmental institutions in the area [] In addition, five focus groups were conducted with members of the community, [] The community-based data collection was complemented by a review of documents and records to extract information on the biophysical and socioeconomic forces contributing to vulnerability. Documents comprised existing studies completed in the area, government	YES			
Reporting of	Yes	reports, climate data, and all other pertinent information. 22 semi-structured, in-depth interviews with 11 male and		YES		
indicators/questions used to		11 female community members, who were asked to describe and explain in local terminology the various				

operationalise		ovposure consitivities, adaptations and adaptive		
construct?		exposure-sensitivities, adaptations and adaptive capacities of importance to them.		
construct				
		[]		
		interviews with key informants from various		
		governmental and non-governmental institutions in the		
		area for the purposes of obtaining further information on		
		the relevant contributing biophysical/socioeconomic		
		forces, exposure-sensitivities, adaptations, and adaptive		
		capac- ities in Mimkyemfre.		
		[]		
		five focus groups were conducted with members of the		
		community, through		
		which data on the experience of vulnerability by residents		
		engaged in primary livelihood activities were gathered.		
		Information on methods of farming, charcoal production		
		and fishing, the stresses on these livelihoods, and the		
		means for overcoming these stresses was compiled. Focus		
		groups were used to investigate interactions between		
		community members and other aspects of vulnerability		
		that became evident in the group dynamic, an effect		
		often referred to as 'synergism' (Morgan 1996).		
Sampling strategies	Yes	Interviewees were selected using purposeful and "typical		
reported?		case" sampling methods in order to obtain an illustrative		
		sample of gender and age groups (Bradshaw and		
		Stratford 2000). Members of the community who were		
		engaged in farming or other commonly- practiced		
		activities were included, as were typically marginalized		
		groups such as women and the elderly, to gain insight on		
		different experiences within the community.		
		[]		
		Key informant interviewees were selected based on their		
		expertise on and/or experience with the community and		
		its environment, and ranged from community members		
		to members of relevant institutions, including local NGOs,		
		the Ministry of Food and Agriculture, the National Health		
		Insurance Scheme, the Department of Forestry and		
		several others.		
		[]		
L	1	[]		

		Participants for focus groups were selected primarily using a combination of purposeful and typical case sampling methods in order to identify members that were representative of the community so as to ensure a typical characterization of the community was obtained.		
Sampling sizes reported?	Yes	 22 semi-structured, in-depth interviews with 11 male and 11 female [] 22 in-depth interviews with key informants [] five focus groups 		
Data analysis methods reported?	Yes	Data from these multiple sources were coded, sorted and analyzed (in part using qualitative data analysis software) according to the themes of the conceptual model of vulnerability in order to identify relevant forces, exposure-sensitivities, adaptations and adaptive capacities experienced at the individual, household and community levels.		

Appendix N: Report of selected operationalizations of retained frameworks

IPCC

Constructs

- Vulnerability (IPCC);

Constructs in report of frameworks	Represented in list by	Coded text indicating relationship
Vulnerability (IPCC)	Vulnerability (IPCC)	
Exposure	Vulnerability (IPCC)	Asper theIPCC's definition and framework, vulnerability is understood as a function of three components—exposure, sensitivity and adaptive capacity.
Sensitivity (A,B)	Vulnerability (IPCC)	Asper theIPCC's definition and framework, vulnerability is understood as a function of three components—exposure, sensitivity and adaptive capacity.
Adaptive Capacity (A)	Vulnerability (IPCC)	Asper theIPCC's definition and framework, vulnerability is understood as a function of three components—exposure, sensitivity and adaptive capacity.
Entity	Vulnerability (IPCC)	An important result of the grammatical investigation is that the concept of vulnerability is a relative one: it is the vulnerability of an entity to a specific stimulus with respect to certain preference criteria
Stimulus	Vulnerability (IPCC)	An important result of the grammatical investigation is that the concept of vulnerability is a relative one: it is the vulnerability of an entity to a specific stimulus with respect to certain preference criteria
Preference criteria	Vulnerability (IPCC)	An important result of the grammatical investigation is that the concept of vulnerability is a relative one: it is the vulnerability of an entity to a specific stimulus with respect to certain preference criteria
Adaptive capacity (var)		No operationalized representative
Reference scenarios		

Ор	erationalization of co	nstructs	
Cor	Construct operationalized: Vulnerability IPCC		
Soι	Source article(s):		
Sel	ected by:	expert selection [justification]	
Sub	o-constructs	Intermediate	
		constructs	
		Directly operationalized	
		constructs	
Cor	nceptual framework		
	erationalization of		
sub	-constructs		
1.	•	Data collection	
		Operational questions	
		Sampling strategies	
		Sample sizes	
		Data analysis	
2.	•	Data collection	
		Operational questions	
		Sampling strategies	
		Sample sizes	
		Data analysis	
3.	•	Data collection	
		Operational questions	
		Sampling strategies	
		Sample sizes	
		Data analysis	
4.	•	Data collection	
		Operational questions	
		Sampling strategies	
		Sample sizes	
		Data analysis	
Car	ndidate-level		
Ana	alysis		

Vulnerability as Expected poverty (with extensions)

Constructs:

- Vulnerability as Expected Poverty
- Food insecurity
- Expected future food security status
- Idiosyncratic shocks
- Covariate shocks
- Household level
- Community level

Constructs in report of frameworks	Represented in list by	Coded text indicating relationship
Vulnerability as Expected Poverty	Vulnerability as Expected Poverty	Directly represented
Poverty	Vulnerability as Expected Poverty	Thus, vulnerability is seen as expected poverty, while consumption (income) is used as a proxy for well-being. This method is based on estimating the probability that a given shock or set of shocks will move household consumption below a given minimum level (such as a consumption poverty line) or force the consumption level to stay below the minimum if it is already below this level (Chaudhuri et al. 2002).
Food insecurity		No operationalized representative
Expected future food security status	Expected future food security status	Directly represented
Future nutritional status		No operationalized representative
Idiosyncratic shocks	Idiosyncratic shocks	Directly represented
Covariate shocks	Covariate shocks	Directly represented
Household level	Household level	Directly represented
Community level	Community level	Directly represented

Ор	Operationalization of constructs		
Сог	nstruct operationalize	d: Vulnerability as Expected	d Poverty
Soι	urce article(s):		
Sel	ected by:	expert selection [justifica	tion]
Sub	o-constructs	Intermediate	
		constructs	
		Directly operationalized	
		constructs	
Cor	nceptual framework		
Ор	erationalization of		
sub	o-constructs		
5.	•	Data collection	
		Operational questions	
		Sampling strategies	
		Sample sizes	

		Data analysis	
6.	•	Data collection	
		Operational questions	
		Sampling strategies	
		Sample sizes	
		Data analysis	
7.	•	Data collection	
		Operational questions	
		Sampling strategies	
		Sample sizes	
		Data analysis	
8.	•	Data collection	
		Operational questions	
		Sampling strategies	
		Sample sizes	
		Data analysis	
Can	didate-level		
Ana	alysis		

Ор	Operationalization of constructs			
Со	Construct operationalized: Expected future food security status			
So	Source article(s): Capaldo et al (2010)			
Se	lected by:	default		
Su	b-constructs	Intermediate constructs	Present food security status; events	
		Directly operationalized	Current socio-economic characteristics; current exposure to	
		constructs	risks; Risks; risk management	
Conceptual Our mode framework 2000; Wo it by Løve recursive determin every poi status an connectio		2000; World Bank 2000) it by Løvendal and Know recursive process: curren determine households' f every point in time hous	ne Social Risk Management approach (Holzmann and Jørgensen and, more specifically, on the conceptual framework drawn from les (2005). In this framework vulnerability is the result of a nt socio-economic characteristics and exposure to risks future characteristics and their risk-management capacity. At eholds' current food security status is affected by their past future status. Figure 1 represents graphically this recursive	
•	erationalization of o-constructs			
9.	Current socio- economic characteristics	s N E	Ve analyze a sample of 1831 rural households from Nicaragua, urveyed in the 2001 Encuesta Nacional de Hogares Sobre Aedición de Nivel de Vida, by the Instituto Nacional de stadísticas y Censos INEC de Nicaragua. Constructed variables used in the analysis were prepared by the Rural Income Generating Activities (RIGA) project team at FAO.	
		Operational II questions t fr d	nformation on the structure of a household includes the age of he head of household (which is also a proxy for working xperience), gender, marital status, language spoken (as a proxy or households belonging to an indigenous group) and the share of female labor. The latter also approximates labor availability within the household. We observed a relatively high proportion of	

· · · · · · · · · · · · · · · · · · ·		
		single- or female-headed households (23% and 18% respectively).
		Household assets are assessed in using education, as well as
		wealth-related variables (number of rooms, cement floor,
		telephone, access to safe water, bikes, radios, TV sets owned4),
		and social capital different
		through participation of members in community organizations.
		Moreover, types of livestock and land assets are also taken into
		account to approximate
		household wealth and potential credit-related constraints. We use
		access to a network for migration as a measure of the ability of a
		household to receive assistance from members living outside the
		-
		location and as a proxy of a diversified income portfolio. Distance
		from a road, school, and health facilities, are variables used for
		measuring a household's access to infrastructure.
		[]
		Table 1: Summary of variables
		Kilocalories per capita
		Age of hh head
		Highest education in hh
		Single head
		Female head of hh widow
		Female headed hh
		Hh labor
		Indigenous household
		Hh size
		Rooms
		Cement floor in house
		Telephone in hh
		Hh members participating in comm. org.
		Access to hh migration network
		Access to safe water
		Bikes owned
		Radios owned
		TVs owned
		Distance to nearest primary school
		Time to nearest health facility
		Distance to nearest major road
		Land owned
		Cattle
		Pigs
		Horses
		Land operated
		Access to irrigation
		Income from farming activities
		Income from farm sales
	Sampling strategies	We analyze a sample of 1831 rural households from Nicaragua,
	Samping strategies	surveyed in the 2001 Encuesta Nacional de Hogares Sobre
		Medición de Nivel de Vida, by the Instituto Nacional de
		Estadísticas y Censos INEC de Nicaragua. Constructed variables
		used in the analysis were prepared by the Rural Income
	c	Generating Activities (RIGA) project team at FAO.
	Sample sizes	sample of 1831 rural households

		Data analysis	After accounting for heteroskedasticity through the use of generalized least squares, we estimate vulnerability to food insecurity as the normal probability that the "individual minimum dietary energy requirement under light physical activity" exceeds the expected individual dietary energy consumption (measured in kilocalories). Since the main purpose of this paper is to propose a methodology to analyze and estimate vulnerability, we ignore possible econometric complications that are not directly relevant. However, by all means the results presented here are to be considered preliminary.
10.	current exposure	Data collection	Same as previous construct
	to risks	Operational questions	We use ex-post data on shocks and risk management strategies. These include information on the incidence of a covariate shock (such as drought) and an idiosyncratic shock (illness) [] Table 1: Summary of variables Drought shock Illness shock
		Sampling strategies	Same as previous construct
		Sample sizes	Same as previous construct
		Data analysis	Same as previous construct
11.	Risks	Data collection	NOT TRANSPARENT
	i lioko	Operational	
		questions	
		Sampling strategies	
		Sample sizes	
		Data analysis	
12.	risk management	Data collection	NOT TRANSPARENT
	0	Operational	
		questions	
		Sampling strategies	
		Sample sizes	
		Data analysis	
13.		Data collection	
		Operational	
		questions	
		Sampling strategies	
		Sample sizes	
		Data analysis	
Can	ididate-level	After accounting for h	eteroskedasticity through the use of generalized least squares, we
Ana	alysis	-	to food insecurity as the normal probability that the "individual
			rgy requirement under light physical activity" exceeds the expected
			rgy consumption (measured in kilocalories). Since the main purpose
			pose a methodology to analyze and estimate vulnerability, we
			metric complications that are not directly relevant. However, by all
		means the results pre	sented here are to be considered preliminary.

Operationalization of constructs Construct operationalized: Idiosyncratic shocks

Source article(s):

Sel	Selected by: expert selection [justification]		
Sub-constructs		Intermediate constructs	
		Directly operationalized	
		constructs	
	nceptual framework		
	erationalization of		
	-constructs		
14.	•	Data collection	
		Operational questions	
		Sampling strategies	
		Sample sizes	
		Data analysis	
15.	•	Data collection	
		Operational questions	
		Sampling strategies	
		Sample sizes	
		Data analysis	
16.	•	Data collection	
		Operational questions	
		Sampling strategies	
		Sample sizes	
		Data analysis	
17.	•	Data collection	
		Operational questions	
		Sampling strategies	
		Sample sizes	
		Data analysis	
Car	didate-level		
Ana	alysis		

Operationalization of co	Operationalization of constructs		
Construct operationalize	Construct operationalized: Covariate shocks		
Source article(s):			
Selected by:	expert selection [justification]	tion]	
Sub-constructs	Intermediate constructs		
	Directly operationalized		
	constructs		
Conceptual framework			
Operationalization of			
sub-constructs			
18. •	Data collection		
	Operational questions		
	Sampling strategies		
	Sample sizes		
	Data analysis		
19. •	Data collection		
	Operational questions		

		Sampling strategies
		Sample sizes
		Data analysis
20. •		Data collection
		Operational questions
		Sampling strategies
		Sample sizes
		Data analysis
21. •	•	Data collection
		Operational questions
		Sampling strategies
		Sample sizes
		Data analysis
Candi	idate-level	
Analy	/sis	

Ор	erationalization of co	nstructs	
Cor	nstruct operationalize	ed: Household level	
Soι	rce article(s):		
Sel	ected by:	expert selection [justifica	tion]
Sub	o-constructs	Intermediate	
		constructs	
		Directly operationalized	
		constructs	
	nceptual framework		
	erationalization of		
sub	-constructs		
22.	•	Data collection	
		Operational questions	
		Sampling strategies	
		Sample sizes	
		Data analysis	
23.	•	Data collection	
		Operational questions	
		Sampling strategies	
		Sample sizes	
		Data analysis	
24.	•	Data collection	
		Operational questions	
		Sampling strategies	
		Sample sizes	
		Data analysis	
25.	•	Data collection	
		Operational questions	
		Sampling strategies	
		Sample sizes	
		Data analysis	
Car	ndidate-level		
Ana	alysis		

Ор	erationalization of co	nstructs	
_	nstruct operationalize		
	urce article(s):	·	
Sel	ected by:	expert selection [justification]	ion]
Sub	o-constructs	Intermediate	
		constructs	
		Directly operationalized	
		constructs	
Cor	nceptual framework		
	erationalization of		
	-constructs		
26.	•	Data collection	
		Operational questions	
		Sampling strategies	
		Sample sizes	
		Data analysis	
27.	•	Data collection	
		Operational questions	
		Sampling strategies	
		Sample sizes	
		Data analysis	
28.	•	Data collection	
		Operational questions	
		Sampling strategies	
		Sample sizes	
		Data analysis	
29.	•	Data collection	
		Operational questions	
		Sampling strategies	
		Sample sizes	
		Data analysis	
Car	ndidate-level		
Ana	alysis		

Perceptions of Climate Change

Constructs:

- Farmer perceptions
- Adaptation strategy

Constructs in report of frameworks	Represented in list by	Coded text indicating relationship
Farmer perceptions	Farmer perceptions	Directly represented
Adaptation strategy	Adaptation strategy	Directly represented
Coping strategy		No operationalized representative

Operationalization of co	nstructs				
Construct operationalized: Farmer perceptions					
Source article(s): Mubay	Source article(s): Mubaya et al				
Selected by:	default				
Sub-constructs	Intermediate				
	constructs				
	Directly operationalized				
	constructs				
Conceptual framework	DIRECETLY OPERATIONAL	IZED			
Operationalization of					
sub-constructs					
30. •	Data collection	The qualitative methods of data collection used include Participatory Rural Appraisal (PRA) techniques such as historical trend analysis and matrix scoring and ranking and Focus Group Discussions (FGDs). The quantitative method used is the household questionnaire survey.			
	Operational questions	2.2.2. Qualitative assessments FGDs were used to first of all establish the general perceptions regarding climate change and variability and their causes and various stressors that confront farmers' livelihoods (see Appendix 2). Following this, it was considered important for this study to factor in how farmers regard climate change and variability as an obstacle to their livelihoods among the multiple stressors that they had identified. Among these stressors are climate variability in different forms, issues of financial capital, issues related to cattle pests and diseases, inadequate draught power, marketing issues and HIV and AIDS. A matrix scoring and ranking exercise was then facilitated for farmers. Farmers were asked as a group to select from the long list of stressors the ones they considered critical for the purposes of scoring and ranking. The second step involved participants defining criteria that they would use to evaluate these stressors. These criteria include food security, income generation, crop production and livelihood security. Through group consensus, farmers then decided how much to allocate each shock out of a total of 20 points, based on the			

I		
		group defined criteria. Historical trend lines were used to elicit information on specific historical trends in farmers' perceptions regarding changes in climate over a period of 20 years and as far back as they could recall. Specifically, participants were asked to recall major occurrences that had a bearing on climate and weather, community resources, and even the political situation. They were then asked to indicate what occurrences had the greatest impact on their livelihoods among the cited events. [] 2.2.3. Quantitative assessments The questionnaire survey was used to collect household data and complement data generated through the qualitative methods. This survey collected data on changes in crops grown over a period of five years and reasons for these changes, indicators for good and bad crop production seasons and years considered to be good or bad over a ten year period. Questions in the survey also related to changes in weather patterns over a ten year period in relation to agriculture and what might have caused these changes. General household characteristics were also captured in this
		survey (see Appendix 1).
	Sampling strategies	A sample of 720 households across countries was selected
		for
		the survey, 180 households per each of the four districts. Specifi- cally, systematic random sampling was employed to come up with six villages per district (making them 24 across countries) and 30 households per each of these villages, making a total of 380 households per country (this study was part of a big inter- institutional research-based development project). For FGDs and PRA workshops, a group of eight to 15 participants was selected to represent the three villages per district, with approximately five representatives from each of the three villages per district. In coming up with this group, factors such as age and gender were used. In terms of gender, separate PRA workshops were held for men and women in order not to compromise the amount and quality of information that can be generated from the less confident if they were to be combined. Specifically, old men and women were incorporated into the sample for the group discussions in order to capture information related to historical trends in climate. Itwas envisaged that they would be able to recall as far back as they could and provide rich information on these trends. In the same context, youths were incorporated into the sample in order to validate some of the recent trends on climate suggested by the elderly.
	Sample sizes	A sample of 720 households across countries was selected for the survey, 180 households per each of the four districts. []
		For FGDs and PRA workshops, a group of eight to 15 participants

		was selected to represent the three villages per district, with approximately five representatives from each of the three villages per district.
	Data analysis	Qualitative data were categorised and analysed in four distinct themes. These themes are Perceptions regarding changes in weather patterns, Perceptions regarding causes of changes and variability in climate, Perceptions regarding other stressors among farmers and Perceptions regarding climate change in relation to other stressors. These perceptions were established in historical trend lines, FGDs and matrix scoring and ranking and they are presented in this manner in the sections under results and discussion. [] Data from the questionnaire survey were entered into the Statistical Package for the Social Sciences (SPSS) and analysed by running descriptive frequencies in relation to the distinct themes highlighted in this section. These themes include perceptions regarding changes in weather patterns in general and for specific seasons and regarding causes of these changes. These frequencies were disaggregated by district and country.
Candidate-level Analysis		

Operationalization of co		
Construct operationalize		
Source article(s):	.a. Addptation strategy	
Selected by:	expert selection [justifica	tion
Sub-constructs	Intermediate	
	constructs	
	Directly operationalized	
	constructs	
Conceptual framework		
Operationalization of		
sub-constructs		
31. •	Data collection	
	Operational questions	
	Sampling strategies	
	Sample sizes	
	Data analysis	
32. •	Data collection	
	Operational questions	
	Sampling strategies	
	Sample sizes	
	Data analysis	
33. •	Data collection	
	Operational questions	
	Sampling strategies	
	Sample sizes	

		Data analysis
34.	•	Data collection
		Operational questions
		Sampling strategies
		Sample sizes
		Data analysis
Candidate-level		
Analysis		

Asset Vulnerability

- Household vulnerability to climate change
- Future exposure;

Constructs in report of frameworks	Represented in list by	Coded text indicating relationship
Household vulnerability to climate	Household vulnerability to climate	Directly represented
change	change	
Asset vulnerability	Household vulnerability to climate change	Using the GLSS 4, we applied the asset vulnerability framework developed by Moser (1996, 1998, 2007). We constructed an index of vulnerability to climate change, at the household level.
Future exposure	Future exposure	Directly represented
Communities at risk of climate shocks		No operationalized representative
Welfare of rural households		No operationalized representative
Prepared for adverse consequences		No operationalized representative

Operationalization of	of constructs			
Construct operationalized: Household vulnerability to climate change				
Source article(s): Da	sgupta & bashieri			
Selected by:	default			
Sub-constructs	Intermediate constructs	Asset vulnerability		
	Directly operationalized constructs	Labour; human capital; non-labour productive assets; social capital		
constructs capital Conceptual framework Using the GLSS 4, we applied the asset vulnerability framework developed by Mode (1996, 1998, 2007). We constructed an index of vulnerability to climate change, a household level. [] The first asset Moser identified is labour. [] The second asset Moser (1998) identified is human capital. [] Non-labour productive assets are the third type. [] Moser (1998) identified household relations		onstructed an index of vulnerability to climate change, at the dentified is labour. er (1998) identified is human capital. assets are the third type.		
Operationalization of	f			
sub-constructs				
35. Labour	Data collection	NOT valid/feasible		
	Operational questions			
	Sampling strategies			
	Sample sizes			
	Data analysis			

36.	human canital	Data collection	NOT valid/feasible	
50.	human capital	Operational questions		
		Sampling strategies		
		Sample sizes		
		Data analysis		
		Sample sizes		
27		Data analysis		
37.	non-labour productive assets	Data collection	by the fourth roun (GLSS 4), which wa Republic of Ghana monitor poverty a contains informati household membe employment, hous activities and agric consumption and o contained househo	ected between April 1998 and March 1999 ad of the Ghana Living Standards Survey as funded by theWorld Bank and the . The survey instruments were designed to nd well- being in Ghana. The GLSS 4 fon on the demographic characteristics of ers, their reported health status, education, sing and income from wages, business cultural production and detailed records of expenditure data. The main data file old-level information and derived money- of poverty such as household income and
		Operational questions	In order to measur	ombe and McKay, 2000). re the different degrees of productive
			assets between households we used the total number of	
				owned by the household as a proxy.
				ole capital assets the questionnaire
				, sewing machines, stoves, refrigerator-
				tioners, fans, radios, radio-cassette players,
				ree-in-one radio-cassette players, video
				ng machines, TVs, cameras, electric irons,
				cles, cars, houses, land, shares, boats,
				ard motors. Each asset was weighted
			equally. []	
			Table 2	
			ASSETS	Variable
			Productive	
				Number of productive asset (N¼3679)
		Sampling strategies	assets	stage probability propertional to size
		Sampling strategies		-stage probability-proportional-to-size
		Sample sizes	sample.	ns data for5998households, of which 3799
		Sample sizes		eas, with 25 694 eligible individual
				ers. We excluded the Greater Accra area as
				aving 3679 rural households. In addition to
				vey, the GLSS 4 team (supervisor and
				nistered a community questionnaire to
				s of the rural enumeration areas that were
				estionnaire was administered to each of the
			195 rural enumera	
		Data analysis		weight assigned to each variable derived
			from the first princ	
				ata reduction that PCA performed on the
				per cent of the original variation of the
			-	or loadings were examined, and the
<u>ا</u> ـــــا		1		

			principal component tended to load positively on variables which contributed to lower vulnerability such as better education and better health, and negatively on variables which contributed to higher household vulnerability such as higher percentage of household income from agriculture. Therefore, the score is a measure of 'strength' or preparedness. A high score indicates a non-vulnerable household, and a low score indicates a vulnerable household.
38.	social capital	Data collection	NOT VALID/FEASIBLE
		Operational questions	
		Sampling strategies	
		Sample sizes	
		Data analysis	
Analysis d		component. The data red of the original variation o principal component tend positively on variables wh education and better hea household vulnerability s agriculture. Therefore, th	assigned to each variable derived from the first principal luction that PCA performed on the data explained 25 per cent of the data. The PCA factor loadings were examined, and the ded to load hich contributed to lower vulnerability such as better of the as better of household income from the score is a measure of 'strength' or preparedness. A high nerable household, and a low score indicates a vulnerable

Оре	erationalization of co	nstructs	
Cor	struct operationalize	d: Future Exposure	
Sou	<pre>irce article(s): NO TRA</pre>	ANSPARENT (FORD & SMIT) OR VALID (DASGUPTA & BASHCIERI) OPERATIONALIZATION
Sele	ected by:	default	
Sub	-constructs	Intermediate	
		constructs	
		Directly operationalized	
		constructs	
Cor	nceptual framework		
Оре	erationalization of		
sub	-constructs		
39.	•	Data collection	
		Operational questions	
		Sampling strategies	
		Sample sizes	
		Data analysis	
40.	•	Data collection	
		Operational questions	
		Sampling strategies	
		Sample sizes	
		Data analysis	
41.	•	Data collection	
		Operational questions	
		Sampling strategies	
		Sample sizes	

		Data analysis
42.	•	Data collection
		Operational questions
		Sampling strategies
		Sample sizes
		Data analysis
Candidate-level		
Ana	alysis	

Nested Vulnerability

Constructs:

- Nested and teleconnected livelihood vulnerability

Constructs in report of frameworks	Represented in list by	Coded text indicating relationship
Livelihood vulnerability (B)	Nested and teleconnected livelihood vulnerability	Directly represented
Nested and teleconnected livelihood vulnerability	Nested and teleconnected livelihood vulnerability	In the following sections, we use the case of the responses of farmers in Vietnam and Mexico to the evolution of the global coffeemarket over the past three decades to illustrate the insights that can be gained fromemploying a concept of nestedandteleconnectedlivelihoodvulnerability. Inthe case we present here, we argue that the vulnerability of individual farmers to the experience of welfare loss is connected not only through the structure of the global coffee commodity chain, but also through global ideological shifts affecting national policy, the movement of labor, the material flow of coffee stocks, channels of information, and, in reverse, through the broader environmental and institutional impli- cations of local adaptive action.
Nested system	Nested and teleconnected livelihood vulnerability	In this article we use the concept of "nested and tele-connected vulnerabilities" to illustrate how the vulnerabilities and responses of farm households in distinct geographic locations are linked through cross-scalar processes, as well as "teleconnected" in space and time. In a nested system, profoundchanges inkeyvariablesthatoperatenormallyonly at one level, e.g., within a defined geographic region or admin- istrative domain, can have non- linear outcomes for processes operating at broader scales of analysis (Gunderson andHolling, 2001)

Operationalization of	Operationalization of constructs			
Construct operationa	lized: Nested and teleconnect	ed livelihood vulnerability		
Source article(s): Eakin et al (2008)				
Selected by:	default	default		
Sub-constructs	Intermediate Livelihood vulnerability constructs			
	Directly operationalized	Nested Systems; Exogenous drivers; geographically specific		

		constructs	signals of change; geographically distant household		
Conceptual framework		In the following sections, we use the case of the responses outcomes of farmers in Vietnam and Mexico to the evolution of the global coffeemarket over the past three decades to illustrate the insights that can be gained fromemploying a concept of nestedandteleconnectedlivelihoodvulnerability. In the case we present here, we argue that the vulnerability of individual farmers to the experience of welfare loss is connected not only through the structure of the global coffee commodity chain, but also through global ideological shifts affecting national policy, the movement of labor, the material flow of coffee stocks, channels of information, and, in reverse, through the broader environmental and institutional impli- cations of local adaptive action. [] In this article we use the concept of "nested and tele- connected vulnerabilities" to illustrate how the vulnerabilities and responses of farm households in distinct geographic locations are linked through cross-scalar processes, as well as "teleconnected" in space and time. In a nested system, profoundchanges inkeyvariablesthatoperatenormallyonly at one level, e.g., within a defined geographic region or admin- istrative domain, can have non-linear outcomes for processes operating at broader scales of analysis (Gunderson andHolling, 2001) [] Livelihood vulner- ability is composed of exogenous risks, household responses to risks, and the outcomes of these responses in terms of individual or household welfare. [] In our case, we argue that geographically specific signals of change – such as a			
		shift in market opportunities, a drought, a change in public policy or new form of			
		land use in a specific location – can create risks and opportunities			
	erationalization of				
sub	-constructs				
43.	Nested Systems	Data collection	NOT TRANSPARENT		
		Operational questions			
		Sampling strategies			
		Sample sizes			
		Data analysis			
44.	Exogenous drivers	Data collection	NOT TRANSPARENT		
		Operational questions			
		Sampling strategies			
		Sample sizes			
		Data analysis			
45.	geographically	Data collection	NOT TRANSPARENT		
	specific signals of	Operational questions			
	change	Sampling strategies			
		Sample sizes			
		Data analysis			
46.	geographically	Data collection	NOT TRANSPARENT		
	distant household	Operational questions			
	vulnerability	Sampling strategies			
		Sample sizes			
		Data analysis			
47.	household	Data collection	NOT TRANSPARENT		

	responses	Operational questions	
		Sampling strategies	
		Sample sizes	
		Data analysis	
48.	response	Data collection	NOT TRANSPARENT
	outcomes	Operational questions	
		Sampling strategies	
		Sample sizes	
		Data analysis	
Car	ndidate-level		
Ana	alysis		

Current and future vulnerability

Constructs:

- Vulnerability to climate risks

Constructs in report of frameworks	Represented in list by	Coded text indicating relationship
Vulnerability to climate risks		
Current vulnerability	Vulnerability to climate risks	A research framework for empirically applying the model of vulnerability proposed above to Arctic commu- nities is illustrated in Figure 3. The first stage assesses current vulnerability by documenting current exposures and current adaptive strategies. The second stage assesses future vulnerability by estimating directional changes in exposure and predicting future adaptive capacity on the basis of past behavior.
Future vulnerability	Vulnerability to climate risks	A research framework for empirically applying the model of vulnerability proposed above to Arctic commu- nities is illustrated in Figure 3. The first stage assesses current vulnerability by documenting current exposures and current adaptive strategies. The second stage assesses future vulnerability by estimating directional changes in exposure and predicting future adaptive capacity on the basis of past behavior.
Current adaptive capacity	Vulnerability to climate risks	The assessment of current vulnerability requires analyzing and documenting communities' experiences with climatic risks (current exposure) and the adaptive options and resource management strategies employed to address these risks (current adaptive capacity).
Exposure	Vulnerability to climate risks	The assessment of current vulnerability requires analyzing and documenting communities' experiences with climatic risks (current exposure) and the adaptive options and resource management strategies employed to address these risks (current adaptive capacity).

Future exposure	Vulnerability to climate risks	Future Exposure Future Vulnerability Future Adaptive Capacity	
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Ope	erationalization of co	nstructs		
		d: Vulnerability to climate	risks	
	-	Smit (2004); Dasgupta & ba		
Cal		default		
	ected by:		for the same that the same to be the sam	
Sub	-constructs	Intermediate	future vulnerability	
		constructs		
		Directly operationalized		
Conceptual framework		constructscapacityA research framework for empirically applying the model of vulnerability proposed above to Arctic commu- nities is illustrated in Figure 3. The first stage assesses current vulnerability by documenting current exposures and current adaptive strategies. The second stage assesses future vulnerability by estimating directional changes in exposure and predicting future adaptive capacity on the basis of past behavior.[]FIG. 3. Analytical framework for vulnerability assessment.Future Exposure Future Vulnerability		
		Future Adaptive Capac	ity	
•	erationalization of			
	-constructs		Г	
49.	Current vulnerability	Data collection	NOT TRANSPARENT	
		Operational questions		
		Sampling strategies		
		Sample sizes		
50		Data analysis		
50.	Future exposure	Data collection	NOT TRANSPARENT (Ford & Smit); Not Valid (Dasgupta & bashieri)	
		Operational questions		
		Sampling strategies		
		Sample sizes		
		Data analysis		
51.	future adaptive	Data collection	NOT TRANSPARENT	
	capacity	Operational questions		
		Sampling strategies		
		Sample sizes		
		Data analysis		
52.	•	Data collection		
		Operational questions		
		Sampling strategies		
		Sample sizes		
		Data analysis		
	ididate-level			
Ana	alysis			

Livelihood vulnerability index

Constructs:

- Livelihood vulnerability (A)

Constructs in report of frameworks	Represented in list by	Coded text indicating relationship
Livelihood vulnerability (A);	Livelihood vulnerability (A);	Directly represented
Livelihood strategies	Livelihood vulnerability (A);	The LVI includes seven major components: Socio-Demographic Profile, Livelihood Strategies, Social Networks, Health, Food, Water, and Natural Disasters and Climate Variability.
Health	Livelihood vulnerability (A);	The LVI includes seven major components: Socio-Demographic Profile, Livelihood Strategies, Social Networks, Health, Food, Water, and Natural Disasters and Climate Variability.
Socio-demographic profile	Livelihood vulnerability (A);	The LVI includes seven major components: Socio-Demographic Profile, Livelihood Strategies, Social Networks, Health, Food, Water, and Natural Disasters and Climate Variability.
Water	Livelihood vulnerability (A);	The LVI includes seven major components: Socio-Demographic Profile, Livelihood Strategies, Social Networks, Health, Food, Water, and Natural Disasters and Climate Variability.
Natural disaster and climate change	Livelihood vulnerability (A);	The LVI includes seven major components: Socio-Demographic Profile, Livelihood Strategies, Social Networks, Health, Food, Water, and Natural Disasters and Climate Variability.

Operationalization of	Operationalization of constructs				
Construct operation	alized: Livelihood vulnerability	(A)			
Source article(s): Ha	hn et al				
Selected by:	Selected by: default				
Sub-constructs	Intermediate constructs	Socio-demographic profile; livelihood strategies; social networks; health; food; water; natural disaster and climate change			
	Directly operationalized constructs	Dependency ratio; percent of female headed households; households with orphans; uneducated headed households; Households working elsewhere; agriculture dependent			

Conceptual framework	household; livelihood diversification; Receive-give ration; borrow-lend ration; independent of local government; Family with chronic illness; proximity to health facility; 2 weeks illness; malaria exposure-prevention; Food from family farm; struggle for food; crop diversity; dont save crops; dont save seeds; Water conflict; natural water source; proximity to water source; inconsistent water supply; inverse water stored; Flood, drought, cyclone events; injury or death from disaster; no warning of disaster; maximum temperature; minimum temperature; average precipitationThe LVI includes seven major components: Socio-Demographic
	Profile, Livelihood Strategies, Social Networks, Health, Food, Water, and Natural Disasters and Climate Variability. [] Socio-demographic profile Explanation of sub-components Ratio of the population under 15 and over 65 years of age to the population between 19 and 64 years of age. Percent of female-headed households
	Percent of households where head of household has not attended school Percent of households with orphans [] Livelihood Percent of households with family member working in a different community Percent of households dependent solely on agriculture as a source of income Percentage of households where the head of the household reports that they have attended 0 years of school. Percentage of households that have at least 1 orphan living in their home. Orphans are children<18 years old who have lost one or both parents. Percentage of households that report at least 1 family member who works outside of the community for their primary work activity. Percentage of households that report only agriculture as a source of income. [] Social Networks Average Receive:Give ratio (range: 0–15) Average Borrow:Lend Money ratio (range: 0.5–2) [] Health Average time to health facility (minutes)
	Percent of households with family member with chronic illness Percent of households where a family member had to miss work or school in the last 2 weeks due to illness Average Malaria Exposure*Prevention Index (range: 0–12) [] Food Percent of households dependent on family farm for food Average number of months households struggle to find food (range: 0–12) [] Water Percent of households reporting water conflicts Percent of households that utilize a natural water source Average time to water source (minutes) Percent of households that do not have a consistent water supply Inverse of the average number of liters of water stored per household (range: >0–1)

[] Natural disasters and climate variability Average number of flood, drought, and cyclone events in the past 6 years (range: 0–7) Percent of households that did not receive a warning about the pending natural disasters Percent of households with an injury or death as a result of the most severe natural disaster in the past 6 years Mean standard deviation of the daily average maximum temperature by month Mean standard deviation of the daily average minimum temperature by month Mean standard deviation of average precipitation by month					
Operationalization of sub-constructs					
53. Dependency ratio	Data collection	household surveys			
	Operational questions	Table 1 includes an explanation of how each sub-component was quantified, the survey question used to collect the data, the original source of the survey question, and potential sources of bias. []			
		Table 1 Major components and sub-components comprising the Livelihood Vulnerability Index (LVI) developed for two districts of Mozambique.			
		Sub-components	Explanation of sub-components	Survey question	
	Someling strategies	Dependency ratio	Ratio of the population under 15 and over 65 years of age to the population between 19 and 64 years of age.	Could you please list the ages and sexes of every person who eats and sleeps in this house? If you had a visitor who ate and slept here for the last 3 days, please include them as well.	
	Sampling strategies We pilot tested the LVI and LVI–IPCC in the Moma a Mabote Districts of Mozambique during 2007. These were see by CARE-Mozambique as representative of coastal a communities, respectively, and the climate change i con- fronting each. [] Based on a sample size calculation (WHO, 2005) at t confidence interval, □10% precision, 50% prevalence design effect of 2 to account for cluster sampling, 20 households in each district were surveyed.2 National 1997 census data a specified the total population in each village was use select 20 villages in each district using the probabilit proportional to size method (WHO, 2005; UNICEF, 2)				

		1			
		Sample sizes	[] 1 50% prevalence re- indicators selected f sample size calculati- indicators is unknow 2 Sample size formu- sample size, DEFF = 0.10. We pilot tested the	or the LVI. This is th ions when the preva /n. ula: N = DEFF*[(Z2*p 2; Z = 1.96 (95% CI),	e default value for llence of the p*q)/e2], where N = p = 0.5; q = 0.5; e =
			Mabote Districts [] 200 households in e district were survey specified the total p select 20 villages in	ed.2 National 1997 o opulation in each vi	
		Data analysis	The LVI uses a balan et al., 2002) where e to the overall index comprised of a diffe Becausewe intended accessible to a diver the LVI formula uses weights to all major could be adjusted by the sub-component scale, it was first nee The equation used f used in the Human I expectancy index, w actual life expectance range of pre- determ expectancy (UNDP, 7 index _{sd} = (sd - smin)/(where sd is the origin smin and smax are to	ced weighted avera each sub-componen even though each m rent number of sub- d to develop an asse se set of users in res the simple approad components. This w y future users as nee s is measured on a c cessary to standardi or this conversion w Development Index thich is the ratio of t cy and a pre-selected nined maximum and 2007): Smax – Smin) nal sub-component he minimum and m	-components. Assment tool source-poor settings, ch of applying equal veighting scheme eded. Because each of lifferent ze each as an index. vas adapted from that to calculate the life he difference of the d minimum, and the d minimum life
54.	percent of female headed households	Data collection Operational questions	Same as previous co Table 1 includes an	explanation of how of survey question use	each sub-component d to collect the data, on, and potential
			comprising the Live	ponents and sub-co elihood Vulnerability districts of Mozamk <i>Explanation of</i> <i>sub-components</i> Percentage of households	y Index (LVI)

			<u>нг.</u>	Ι.	I
			households	where the	household?
				primary adult is	
				female. If a male	
				head is away	
				from the home	
				>6 months per	
				year the female	
				is counted as the	
				head of the	
				household.	
		Sampling strategies	Same as previous co	onstruct	
		Sample sizes	Same as previous co	onstruct	
		Data analysis	Same as previous co		
55.	households with	Data collection	Same as previous co		
	orphans	Operational questions			each sub-component
	•				d to collect the data,
				of the survey questic	
			sources of bias.	7 1	, ,
			[]		
			Table 1 Major com	ponents and sub-co	mponents
				elihood Vulnerability	
				districts of Mozamb	
			Sub-components	Explanation of	Survey question
				sub-components	
			Percent of	Percentage of	Are there any
			households with	households that	children less
			orphans	have at least 1	than 18 years old
				orphan living in	from other
				their home.	families living in
				Orphans are	your house
				children<18	because one or
				years old who	both of their
				have lost one or	parents has
					died?
		Sampling strategies	Samo as provious a	both parents.	
		Sampling strategies	Same as previous co		
		Sample sizes	Same as previous co		
EC	upoducated	Data analysis	Same as previous co		
56.	uneducated	Data collection	NOT TRANSPARENT		
	headed	Operational questions			
	households	Sampling strategies			
		Sample sizes			
		Data analysis	Company ()		
57.		Data collection	Same as for 'depend		
1	working elsewhere	Operational questions			each sub-component
					d to collect the data,
			-	of the survey questic	on, and potential
			sources of bias.		
1			[]		
1			-	ponents and sub-co	-
		1	I Comprising the Liv	elihood Vulnerability	/ Index (LVI)

			doveloped for two	districts of Mazamk	alguno.
				districts of Mozamb	
			Sub-components	Explanation of sub-components	Survey question
		Sampling strategies Sample sizes	Percent of households with family member working in a different community Same as for 'depend Same as for 'depend	Percentage of households that report at least 1 family member who works outside of the community for their primary work activity.	How many people in your family go to a different community to work?
		Data analysis	Same as for 'depend		
58.	agriculturo	Data collection	Same as previous co		
50.	agriculture dependent	Operational questions			each sub-component
	household		was quantified, the the original source of sources of bias. [] Table 1 Major com	survey question use	d to collect the data, on, and potential mponents
			· -		
			Sub-components	districts of Mozamk	Survey question
			Sub-components	sub-components	Survey question
			Percent of households dependent solely on agriculture as a source of income	Percentage of households that report only agriculture as a source of income.	Do you or someone else in your household raise animals? Do you or someone else in your household grow crops? Do you or someone else in your household collect something from the bush, the forest, or lakes and rivers to sell?
		Sampling strategies	Same as previous co	onstruct	
		Sample sizes	Same as previous co		
		Data analysis	Same as previous co		
59.	livelihood	Data collection	Same as previous co		
	diversification	Operational questions	Table 1 includes an	explanation of how survey question use	each sub-component d to collect the data, on, and potential

			[]		
			Table 1 Major com	nonants and sub as	magazete
			-	ponents and sub-co elihood Vulnerability	
				districts of Mozamk	
			Sub-components	Explanation of	Survey question
			Sub-components	sub-components	Survey question
			Average	The inverse of	Do you or
			Agricultural	(the number of	someone else in
			Livelihood	agricultural	your household
			Diversification	livelihood	raise animals?
			Index (range:	activities +1)	Do you or
			0.20–1)a	reported by a	someone else in
				household, e.g.,	your household
				A household that	grow crops? Do
				farms, raises	you or someone
				animals, and	else in your
				collects natural	household
				resources will	collect
				have a	something from
				Livelihood	the bush, the
				Diversification	forest, or lakes
				Index = 1/(3 + 1)	and rivers to
				= 0.25.	sell?
		Sampling strategies	Same as previous co	onstruct	
		Sample sizes	Same as previous co		
		Data analysis	Same as previous co		
60.	Receive-give ratio	Data collection	Same as previous co		
		Operational questions			each sub-component d to collect the data,
				of the survey question use	
			sources of bias.	of the survey question	
			[]		
			[]		
			Table 1 Major com	ponents and sub-co	mponents
			-	elihood Vulnerability	
			developed for two	districts of Mozamb	pique.
			Sub-components	Explanation of	Survey question
				sub-components	
			Average	Ratio of (the	In the past
			Receive:Give	number of types	month, did
			ratio (range: 0–	of help received	relatives or
			15)	by a household	friends help you
				in the past	and your family:
				month + 1) to	(e.g., Get
				(the number of	medical care or
				types of help	medicines, Sell
				given by a household to	animal products
				someone else in	or other goods produced by
				the past month +	family, Take care
1				1).	of children) In
		1	11	±/·	or children jin

		1		1	
					the past month,
					did you and your
					family help
					relatives or
					friends: (same
					choices as
					above)
		Sampling strategies	Same as previous co	onstruct	· · · · · · · · · · · · · · · · · · ·
		Sample sizes	Same as previous co		
		Data analysis	Same as previous co		
61.	borrow-lend ratio	Data collection	Same as previous co		
01.	Dollow-lend latio	Operational questions	-		each sub-component
		Operational questions			d to collect the data,
			-		
			the original source of	of the survey questic	on, and potential
			sources of bias.		
			[]		
			-	ponents and sub-co	-
				elihood Vulnerability	
			developed for two	districts of Mozamb	pique.
			Sub-components	Explanation of	Survey question
				sub-components	
			Average	Ratio of a	Did you borrow
			Borrow:Lend	household	any money from
			Money ratio	borrowing	relatives or
			(range: 0.5–2)	money in the	friends in the
				past month to a	past month? Did
				household	
					you lend any
				lending money in	money to
				the past month,	relatives or
				e.g., lf a	friends in the
				household	past month?
				borrowed	
				money but did	
				not lend money,	
				the ratio = 2:1 or	
				2 and if they lent	
				money but did	
				not borrow any,	
				the ratio = 1:2 or	
				0.5.	
		Sampling strategies	Same as provious of		<u> </u>
		Sampling strategies	Same as previous co		
		Sample sizes	Same as previous co		
		Data analysis	Same as previous co		
62.		Data collection	Same as previous co		
	local government	Operational questions			each sub-component
			-		d to collect the data,
			the original source of	of the survey questic	on, and potential
			sources of bias.		
			[]		
			Table 1 Maior com	ponents and sub-co	mponents

			comprising the Livelihood Vulnerability Index (LVI)		
				districts of Mozam	
			Sub-components	Explanation of sub-components	Survey question
		Sampling strategies Sample sizes Data analysis	Percent of households that have not gone to their local government for assistance in the past 12 months Same as previous co Same as previous co	Percentage of households that reported that they have not asked their local government for any assistance in the past 12 months.	In the past 12 months, have you or someone in your family gone to your community leader for help?
63.	Family with chronic	Data collection	Same as previous construct Same as previous construct		
	illness	Operational questions	Table 1 includes an was quantified, the	explanation of how	each sub-component d to collect the data, on, and potential
			comprising the Liv	ponents and sub-co elihood Vulnerability districts of Mozamk <i>Explanation of</i>	y Index (LVI)
				sub-components	
			Percent of households with family member with chronic illness	Percentage of households that report at least 1 family member with chronic illness. Chronic illness was defined subjectively by respondent.	Is anybody in your family chronically ill (they get sick very often)?
		Sampling strategies	Same as previous co	onstruct	
		Sample sizes	Same as previous co		
		Data analysis	Same as previous co		
64.	proximity to health facility	Data collection Operational questions	Same as previous co Table 1 includes an		each sub-component
			was quantified, the the original source of sources of bias. [] Table 1 Major com comprising the Liv	survey question use	d to collect the data, on, and potential mponents y Index (LVI)

		1	Г <u>Г</u>		1
				sub-components	
			Average time to	Average time it	Howlong does it
			health facility	takes the	take you to get
			(minutes)	households to	to a health
				get to the	facility?
				nearest health	
				facility.	
		Sampling strategies	Same as previous co	nstruct	
		Sample sizes	Same as previous co		
		Data analysis	Same as previous co		
65.	2 weeks illness	Data collection	Same as previous co		
05.	2 WEEKS IIIIESS	Operational questions			each sub-component
		Operational questions			
			-		d to collect the data,
			the original source o	t the survey questic	on, and potential
			sources of bias.		
			[]		
			Table 1 Major com		
			comprising the Live	lihood Vulnerability	/ Index (LVI)
			developed for two	districts of Mozamb	pique.
			Sub-components	Explanation of	Survey question
				sub-components	
			Percent of	Percentage of	Has anyone in
			households	households that	your family been
			where a family	report at least 1	so sick in the
			member had to	family member	past 2 weeks
			miss work or	who had to miss	that they had to
			school in the last	school of work	miss work or
			2 weeks due to	due to illness in	school?
			illness	the last 2 weeks.	301001:
		Sampling strategies	Same as previous co		
		Sample sizes	Same as previous co		
		Data analysis	Same as previous co		
66.	malaria exposure-	Data collection	Same as previous co		
	prevention	Operational questions	Table 1 includes an e	explanation of how	each sub-component
			was quantified, the s	survey question use	d to collect the data,
			the original source o	f the survey questic	on, and potential
			sources of bias.		
			[]		
			Table 1 Major com	oonents and sub-co	mponents
			comprising the Live		•
			developed for two		
			Sub-components	Explanation of	· · ·
				sub-componer	-
			Average Malaria	Months	Which months
			Exposure*Preventi		
					of the year is
			Index (range: 0–12)		malaria
				malaria*Owni	•
				at least one	bad? How
				bednet indicat	,
				(have bednet =	 mosquito nets

		1			
				0.5, no bednet	:= do you have?
				1) (e.g.,	
				Respondent	
				reported mala	ria
				is a problem	
				January–Marc	h
				and they do no	
				own a bednet	
				3*1 = 3).	-
			Company in the second	·	
		Sampling strategies	Same as previous co		
		Sample sizes	Same as previous co		
		Data analysis	Same as previous co		
67.	,	Data collection	Same as previous co		
	farm	Operational questions			each sub-component
			was quantified, the	survey question use	d to collect the data,
			the original source of	of the survey questic	on, and potential
			sources of bias.		
			[]		
			Table 1 Maior com	ponents and sub-co	mponents
				elihood Vulnerability	
				districts of Mozamb	
			Sub-components	Explanation of	Survey question
			Sub-components	sub-components	Survey question
			Percent of	Percentage of	Whore does your
				-	Where does your
			households	households that	family get most
			dependent on	get their food	of its food?
			family farm for	primarily from	
			food	their personal	
				farms.	
		Sampling strategies	Same as previous co	onstruct	
		Sample sizes	Same as previous co	onstruct	
		Data analysis	Same as previous co	onstruct	
68.	struggle for food	Data collection	Same as previous co	onstruct	
		Operational questions	Table 1 includes an	explanation of how e	each sub-component
			was quantified, the	survey question use	d to collect the data,
			the original source of		
			sources of bias.		
			[]		
			Table 1 Major com	ponents and sub-co	mponents
			-	elihood Vulnerability	-
				districts of Mozamb	
			Sub-components	Explanation of	Survey question
					Survey question
				sub-components	Deserveur familie
			Average number	Average number	Does your family
			of months	of months	have adequate
			households	households	food the whole
			struggle to find	struggle to	year, or are there
			food (range: 0–	obtain food for	times during the
			12)	their family.	year that your
1				,	family does not
			· -		-
1			11	1	family does not

		I			
					have enough
					food?
					Howmanymonths
					a year does your
					family have
					trouble getting
					enough food?
		Sampling strategies	Same as previous co	onstruct	
		Sample sizes	Same as previous co	onstruct	
		Data analysis	Same as previous co	onstruct	
69.	crop diversity	Data collection	Same as previous co	onstruct	
	. ,	Operational questions	Table 1 includes an	explanation of how	each sub-component
					d to collect the data,
			-	of the survey questic	
			sources of bias.		,
			[]		
			[]		
			Table 1 Major com	ponents and sub-co	mnonents
				elihood Vulnerability	•
				districts of Mozamk	
					Survey question
			Sub-components	Explanation of	Survey question
				sub-components	
			Average Crop	The inverse of	What kind of
			Diversity Index	(the number of	crops does your
			(range: >0–1)a	crops grown by a	household grow?
				household +1).	
				e.g., A household	
				that grows	
				pumpkin, maize,	
				nhemba beans,	
				and cassava will	
				have a Crop	
				Diversity	
		Sampling strategies	Same as previous co	onstruct	•
		Sample sizes	Same as previous co	onstruct	
		Data analysis	Same as previous co	onstruct	
70.	dont save crops	Data collection	Same as previous co		
	·	Operational questions	Table 1 includes an	explanation of how	each sub-component
					d to collect the data,
				of the survey question	
			sources of bias.		,
			[]		
			[]		
			Table 1 Major com	ponents and sub-co	mponents
			-	elihood Vulnerability	-
				districts of Mozamk	
			Sub-components	Explanation of	Survey question
					Survey question
			Deveent -f	sub-components	Deservers
			Percent of	Percentage of	Does your family
			households that	households that	save some of the
			do not save	do not save	crops you
			crops	crops from each	harvest to eat

n S uestions T v t s	was quantified, the the original source of sources of bias. []	onstruct onstruct onstruct explanation of how	different time of year? each sub-component d to collect the data, on, and potential	
n S uestions T v t s	Same as previous co Same as previous co Same as previous co Table 1 includes an o was quantified, the the original source o sources of bias. []	onstruct onstruct onstruct explanation of how survey question use	each sub-component d to collect the data,	
n S uestions T v t s	Same as previous co Same as previous co Same as previous co Table 1 includes an o was quantified, the the original source o sources of bias. []	onstruct onstruct onstruct explanation of how survey question use	d to collect the data,	
n S uestions T v t s	Same as previous co Same as previous co Table 1 includes an was quantified, the the original source o sources of bias. []	onstruct onstruct explanation of how survey question use	d to collect the data,	
n S uestions T v t s	Same as previous co Table 1 includes an was quantified, the the original source o sources of bias. []	onstruct explanation of how survey question use	d to collect the data,	
uestions T v t s	Table 1 includes an was quantified, the the original source of sources of bias. []	explanation of how survey question use	d to collect the data,	
v t s	was quantified, the the original source of sources of bias. []	survey question use	d to collect the data,	
t s	the original source of sources of bias. []			
	T 4 NA :			
		ponents and sub-co elihood Vulnerability		
	developed for two	districts of Mozamb	pique.	
	Sub-components	Explanation of	Survey question	
		sub-components		
	Percent of	Percentage of	Does your family	
	households that		save seeds to	
			grow the next	
	seeds	-	year?	
	· · · · ·			
	· · · · · · · · · · · · · · · · · · ·			
v t s	was quantified, the the original source c sources of bias.	survey question use	d to collect the data,	
	Table 1 Major com	ponents and sub-co	mponents	
	comprising the Livelihood Vulnerability Index (LVI)			
	developed for two	districts of Mozamb	pique.	
	Sub-components	Explanation of	Survey question	
		U U	In the past year,	
			have you heard	
			about any	
	conflicts		conflicts over	
			water in your	
			community?	
	Same as provious of		<u> </u>	
-	•			
	Same as previous co			
tegies S	Same as previous co			
	Same as previous construct			
S	Same as previous co			
r	n stions regies s	do not save seeds regies Same as previous components Same as previous components Same as previous components Table 1 includes an was quantified, the the original source of bias. Image: Component state of the second s	households that do not save seedshouseholds that do not have seeds from year to year.regiesSame as previous constructSame as previous constructSame as previous constructSame as previous constructuestionsTable 1 includes an explanation of how was quantified, the survey question use the original source of the survey question sources of bias. []Table 1 Major components and sub-co comprising the Livelihood Vulnerability developed for two districts of MozambSub-componentsExplanation of sub-componentsPercent of households reporting water conflictsPercentage of households that report having heard about conflicts over water in their community.	

	source	Operational questions	Table 1 includes an explanation of how each sub-component was quantified, the survey question used to collect the data, the original source of the survey question, and potential sources of bias. []		
			-	ponents and sub-co elihood Vulnerabilit	-
				districts of Mozami	
			Sub-components	Explanation of sub-components	Survey question
			Percent of households that utilize a natural water source	Percentage of households that report a creek, river, lake, pool, or hole as their primary water source.	Where do you collect your water from?
		Sampling strategies	Same as previous co	onstruct	·
		Sample sizes	Same as previous co		
		Data analysis	Same as previous co	onstruct	
74.	proximity to water	Data collection	Same as previous co	onstruct	
			was quantified, the survey question used to collect the data, the original source of the survey question, and potential sources of bias. []		
			comprising the Liv	ponents and sub-co elihood Vulnerabilit districts of Mozami	y Index (LVI)
			Sub-components	Explanation of sub-components	Survey question
			Average time to water source (minutes)	Average time it takes the households to travel to their primary water source.	How long does it take to get to your water source?
		Sampling strategies	Same as previous co	onstruct	
		Sample sizes	Same as previous co		
		Data analysis	Same as previous co		
75.	inconsistent water supply	Data collection Operational questions		explanation of how survey question use	each sub-component d to collect the data, on, and potential
			-	ponents and sub-co elihood Vulnerabilit	-

			developed for two	o districts of Mozar	mbique
1			Sub-components	Explanation of	Survey question
			Sub-components	sub-components	
			Percent of	Percentage of	ls this water
			households that	households that	
			do not have a	report that	everyday?
			consistent water	water is not	everyuay!
				available at their	
			supply	primary water	
				source everyday	
		Sampling strategies	Same as previous c		
		Sample sizes	Same as previous c		
76		Data analysis	Same as previous c		
76.	inverse water	Data collection	Same as previous c		
	stored	Operational questions			w each sub-component
			-		sed to collect the data,
			the original source	of the survey ques	tion, and potential
			sources of bias.		
			[]		
			Table 4 Mains and		
				nponents and sub-	
				elihood Vulnerabil	
				o districts of Mozar	
			Sub-components	Explanation of	Survey question
				sub-components	
			Inverse of the	The inverse of	What containers
			average number	(the average	do you usually
			of liters of water	number of liters	
			stored per	of water stored	How many? How
			household	by each	many liters are
			(range: >0–1)	household + 1).	they?
		Sampling strategies	Same as previous c		
		Sample sizes	Same as previous c		
	Flood drawelt	Data analysis	Same as previous c		
77.	Flood, drought,	Data collection	Same as previous c		work sub company
	cyclone events	Operational questions			w each sub-component sed to collect the data,
			the original source		
			sources of bias.	of the survey ques	tion, and potential
			[]		
			[]		
			Table 1 Major con	nponents and sub-	components
			-	elihood Vulnerabil	-
				o districts of Mozar	
			Sub-		Survey question
				sub-	Juivey question
			components		
			Average	<i>components</i> Total number	How many times has
			Average number of		this area been
					affected by a
			and cyclone		flood/cyclone/drought
			events in the	were reported	in 2001–2007?

					1	
			past 6 years	by households		
			(range: 0–7)	in the past 6		
				years.		
		Sampling strategies	Same as previous			
		Sample sizes	Same as previous			
		Data analysis	Same as previous			
78.	injury or death	Data collection	Same as previous			
	from disaster	Operational questions	Table 1 includes an explanation of how each sub-component was quantified, the survey question used to collect the data, the original source of the survey question, and potential sources of bias. []			
			comprising the L	omponents and su ivelihood Vulnera vo districts of Moz	bility Index (LVI)	
			Sub-	Explanation of	Survey question	
			components	sub-	-7 -7	
			,	components		
			Percent of households with an injury or death as a result of the most severe natural disaster in the past 6 years	Percentage of households that reported either an injury to or death of one of their family members as a result of the most severe flood, drought, or cyclone in the past 6 years.	Was anyone in your family injured in the flood/cyclone drought? Did anyone in your family die during the flood/cyclone/drought?	
		Sampling strategies	Same as previous			
		Sample sizes	Same as previous			
		Data analysis	Same as previous			
79.	no warning of	Data collection				
	disaster	Operational questions	Same as previous construct Table 1 includes an explanation of how each sub-component was quantified, the survey question used to collect the data, the original source of the survey question, and potential sources of bias. []		used to collect the data,	
			Table 1 Major co	omponents and su	b-components	
				ivelihood Vulnera		
				vo districts of Moz		
			Sub- components	Explanation of sub-	Survey question	
				components		
			Percent of	Percentage of	Did you receive a	
			households	households	warning about the	
			that did not	that did not	flood/cyclone/drought	

<u> </u>				-	
			receive a	receive a	before it happened?
			-	warning about	
				the most	
				severe flood,	
			disasters	drought, and	
				cyclone event	
				in the past 6	
				years.	
		Sampling strategies	Same as previous c	onstruct	
		Sample sizes	Same as previous c		
		Data analysis	Same as previous o		
80.	maximum	Data collection	provincial data; we		d in the provincial
00.	temperature	Data conection	capital	attier station base	
		Operational questions			
			Table 1 Major con	nponents and sub-	components
			comprising the Liv		
			developed for two		
			Sub-components	Explanation of	Survey question
				sub-component.	
			Mean standard	Standard	1998–2003:
			deviation of the	deviation of the	
			daily average	average daily	weather station
			maximum	maximum	based in the
			temperature by	temperature by	
			month	month between	
			monun		
				1998 and 2003	
				was averaged fo	br
				each provinceb	
		Sampling strategies			
		Sample sizes			
		Data analysis	Same as previous c	onstruct	
81.		E ata analysis			
l	minimum	Data collection	provincial data; we	ather station base	d in the provincial
		· · ·	provincial data; we capital	ather station base	d in the provincial
	minimum temperature	· · ·	-	ather station base	d in the provincial
		Data collection	-	ather station base	d in the provincial
		Data collection	capital		
		Data collection	capital Table 1 Major con	nponents and sub-	components
		Data collection	capital Table 1 Major con comprising the Liv	nponents and sub- relihood Vulnerabi	components lity Index (LVI)
		Data collection	capital Table 1 Major con comprising the Liv developed for two	nponents and sub- velihood Vulnerabi	components lity Index (LVI) mbique.
		Data collection	capital Table 1 Major con comprising the Liv	nponents and sub- relihood Vulnerabi o districts of Moza <i>Explanation of</i>	components lity Index (LVI) mbique. Survey question
		Data collection	Capital Table 1 Major con comprising the Liv developed for two Sub-components	nponents and sub- velihood Vulnerabi districts of Moza Explanation of sub-component	components lity Index (LVI) mbique. Survey question s
		Data collection	Capital Table 1 Major con comprising the Liv developed for two Sub-components Mean standard	nponents and sub- velihood Vulnerabi districts of Moza <i>Explanation of</i> <i>sub-component</i> Standard	components lity Index (LVI) mbique. Survey question s 1998–2003:
		Data collection	capital Table 1 Major con comprising the Liv developed for two Sub-components Mean standard deviation of the	nponents and sub- velihood Vulnerabi o districts of Moza <i>Explanation of</i> <i>sub-component</i> Standard deviation of the	components lity Index (LVI) mbique. Survey question s 1998–2003: provincial data;
		Data collection	capital Table 1 Major con comprising the Liv developed for two Sub-components Mean standard deviation of the daily average	nponents and sub- relihood Vulnerabi o districts of Moza <i>Explanation of</i> <i>sub-component</i> Standard deviation of the average daily	components lity Index (LVI) mbique. Survey question s 1998–2003: provincial data; weather station
		Data collection	capital Table 1 Major con comprising the Liv developed for two Sub-components Mean standard deviation of the daily average minimum	nponents and sub- velihood Vulnerabi o districts of Moza <i>Explanation of</i> <i>sub-component</i> . Standard deviation of the average daily minimum	components lity Index (LVI) mbique. Survey question s 1998–2003: provincial data; weather station based in the
		Data collection	capital Table 1 Major con comprising the Liv developed for two Sub-components Mean standard deviation of the daily average minimum temperature by	nponents and sub- velihood Vulnerabi o districts of Moza <i>Explanation of</i> <i>sub-component</i> Standard deviation of the average daily minimum temperature by	components lity Index (LVI) mbique. Survey question s 1998–2003: provincial data; weather station based in the provincial capital
		Data collection	capital Table 1 Major con comprising the Liv developed for two Sub-components Mean standard deviation of the daily average minimum	nponents and sub- velihood Vulnerabi o districts of Moza <i>Explanation of</i> <i>sub-component</i> Standard deviation of the average daily minimum temperature by month between	components lity Index (LVI) mbique. Survey question s 1998–2003: provincial data; weather station based in the provincial capital
		Data collection	capital Table 1 Major con comprising the Liv developed for two Sub-components Mean standard deviation of the daily average minimum temperature by	nponents and sub- velihood Vulnerabi o districts of Moza <i>Explanation of</i> <i>sub-component</i> Standard deviation of the average daily minimum temperature by month between 1998 and 2003	components lity Index (LVI) mbique. Survey question s 1998–2003: provincial data; weather station based in the provincial capital
		Data collection	capital Table 1 Major con comprising the Liv developed for two Sub-components Mean standard deviation of the daily average minimum temperature by	nponents and sub- velihood Vulnerabi o districts of Moza <i>Explanation of</i> <i>sub-component</i> Standard deviation of the average daily minimum temperature by month between	components lity Index (LVI) mbique. Survey question s 1998–2003: provincial data; weather station based in the provincial capital
		Data collection	capital Table 1 Major con comprising the Liv developed for two Sub-components Mean standard deviation of the daily average minimum temperature by	nponents and sub- velihood Vulnerabi o districts of Moza <i>Explanation of</i> <i>sub-component</i> Standard deviation of the average daily minimum temperature by month between 1998 and 2003	components lity Index (LVI) mbique. Survey question s 1998–2003: provincial data; weather station based in the provincial capital
		Data collection	capital Table 1 Major con comprising the Liv developed for two Sub-components Mean standard deviation of the daily average minimum temperature by	nponents and sub- relihood Vulnerabi o districts of Moza <i>Explanation of</i> <i>sub-component</i> . Standard deviation of the average daily minimum temperature by month between 1998 and 2003 was averaged for	components lity Index (LVI) mbique. Survey question s 1998–2003: provincial data; weather station based in the provincial capital

		Data analysis			
82.	average precipitation	Data collection	provincial data; weather station based in the provincial capital		
		Operational questions			
comp		comprising the Live	Table 1 Major components and sub-components comprising the Livelihood Vulnerability Index (LVI) developed for two districts of Mozambigue.		
			Sub-components	Explanation of sub-components	Survey question
			Mean standard deviation of average precipitation by month	Standard deviation of the average monthly precipitation between 1998 and 2003 was averaged for each province	1998–2003: provincial data; weather station based in the provincial capital
		Sampling strategies			
		Sample sizes			
L		Data analysis	Same as previous co	onstruct	
	ndidate-level alysis	Same as 'dependency ra	tio'		

Intensifying vulnerability to food insecurity

Constructs:

- Livelihood strategies

Constructs in report of frameworks	Represented in list by	Coded text indicating relationship
Livelihood level issues		No operationalized representative
Access to sufficient food		No operationalized representative
Food insecurity		No operationalized representative
Household and community vulnerability		No operationalized representative
Livelihood strategies	Livelihood strategies	Direct representation
Direct drivers		No operationalized representative

Ор	Operationalization of constructs				
Cor	nstruct operationalize	d: Livelihood strategies			
Sou	urce article(s): Hahn e	t al			
Sel	ected by:	Default			
Sub	o-constructs	Intermediate			
		constructs			
		Directly operationalized	Households working	g elsewhere; agricult	ture dependent
		constructs	household; livelihoo	od diversification	
Percent of households Percentage of households have attended 0 years Percentage of households Orphans are children< Percentage of households outside of the communication		s with family member working in a different community s dependent solely on agriculture as a source of income olds where the head of the household reports that they s of school. Tolds that have at least 1 orphan living in their home. (18 years old who have lost one or both parents. Tolds that report at least 1 family member who works nity for their primary work activity. Tolds that report only agriculture as a source of income.			
Ор	erationalization of				
-	o-constructs				
83.	Households	Data collection	Household survey		
	working elsewhere	Operational questions	Table 1 includes an explanation of how each sub-componer was quantified, the survey question used to collect the data the original source of the survey question, and potential sources of bias. []		d to collect the data,
			Table 1 Major com	nonents and sub-co	omponents
			Table 1 Major components and sub-componentscomprising the Livelihood Vulnerability Index (LVI)developed for two districts of Mozambique.		
			Sub-components	Explanation of sub-components	Survey question
			Percent of households with	Percentage of households that	How many people in your
			family member	report at least 1	family go to a
			working in a	family member	different

	-1:66						
	different	who works	community to				
	community	outside of the	work?				
		community for					
		their primary					
		work activity.					
Sampling s		the LVI and LVI–IPCC in	the Moma and				
	Mabote						
		ambique during 2007.					
	-	nbique as representativ					
		espectively, and the clin	nate change issues				
	con- fronting ea	ch.					
	[]						
		ple size calculation (WH					
		confidence interval, \Box 10% precision, 50% prevalence,1 and a					
	-	2 to account for cluster	r sampling, 200				
	households in e						
		veyed.2 National 1997					
	-	tal population in each v	-				
	_	s in each district using					
		size method (WHO, 20	05; UNICEF, 2008).				
	[]						
	•	e refers to the point p					
		ed for the LVI. This is t					
		ulations when the prev	alence of the				
		indicators is unknown.					
	-	2 Sample size formula: N = DEFF*[(Z2*p*q)/e2], where N =					
		sample size, DEFF = 2; Z = 1.96 (95% Cl), p = 0.5; q = 0.5; e =					
	0.10.						
Sample size	-	the LVI and LVI–IPCC in	the Moma and				
	Mabote						
	Districts						
	[]						
		200 households in each district were surveyed.2 National 1997 census data that					
	-	tal population in each v	mage was used to				
)	s in each district					
Data analy:		alanced weighted aver					
	-	ere each sub-componen					
		dex even though each i					
	-	different number of sub					
		nded to develop an ass					
		liverse set of users in re					
		uses the simple approa					
	-	ajor components. This					
			eded. Because each of				
	· · · ·	nents is measured on a					
		t necessary to standard					
	-	ed for this conversion					
		nan Development Index					
		ex, which is the ratio of					
		tancy and a pre-selecte					
		termined maximum an	a minimum life				
	expectancy (UN	DP, 2007):					

	[1			
			$index_{sd} = (s_d - s_{min})/($		A 1 1 1
			where sd is the orig	-	
			smin and smax are t		-
			respectively, for each sub-component determined using data		
			from both districts.		
84.	0	Data collection	Same as previous co		
	dependent	Operational questions			each sub-component
	household				d to collect the data,
			the original source of	of the survey questic	on, and potential
			sources of bias.		
			[]		
				ponents and sub-co	
				elihood Vulnerability	
			· · · · · · · · · · · · · · · · · · ·	districts of Mozama	
			Sub-components	Explanation of sub-components	Survey question
			Percent of	Percentage of	Do you or
			households	households that	someone else in
			dependent solely	report only	your household
			on agriculture as	agriculture as a	raise animals?
			a source of	source of	Do you or
			income	income.	someone else in
					your household
					grow crops? Do
					you or someone
					else in your
					household
					collect
					something from
					the bush, the
					forest, or lakes
					and rivers to
					sell?
		Sampling strategies	Same as previous co		· · ·
		Sample sizes	Same as previous co		
		Data analysis	Same as previous co		
85.		Data collection	Same as previous co		
	diversification	Operational questions		-	each sub-component
			•		d to collect the data,
			the original source of	of the survey questic	on, and potential
			sources of bias.		
			[]		
			Table 1 Major com	ponents and sub-co	mponents
				elihood Vulnerability	
			developed for two	districts of Mozama	pique.
			Sub-components	Explanation of	Survey question
				sub-components	
			Average	The inverse of	Do you or
			Agricultural	(the number of	someone else in
1			Livelihood	agricultural	your household

		1	_				
			Diversification	livelihood	raise animals?		
			Index (range:	activities +1)	Do you or		
			0.20–1)a	reported by a	someone else in		
				household, e.g.,	your household		
				A household that	grow crops? Do		
				farms, raises	you or someone		
				animals, and	else in your		
				collects natural	household		
				resources will	collect		
				have a	something from		
				Livelihood	the bush, the		
				Diversification	forest, or lakes		
				Index = 1/(3 + 1)	and rivers to		
				= 0.25.	sell?		
		Sampling strategies	Same as previous co	onstruct			
		Sample sizes	Same as previous co	onstruct			
		Data analysis	Same as previous co	onstruct			
		Data analysis					
Can	didate-level	The LVI uses a balanced weighted average approach (Sullivan					
Ana	lysis	et al., 2002) where each sub-component contributes equally to the overall index even					
		though each major component is comprised of a different number of sub-components.					
		Becausewe intended to develop an assessment tool accessible to a diverse set of users					
		in resource-poor settings, the LVI formula uses the simple approach of applying equal					
		weights to all major comp		-			
		users as needed. Because each of the sub-components is measured on a different					
		scale, it was first necessar	ry to standardize eacl	n as an index. The eq	uation used for this		
		conversion was adapted f	from that used in the	Human Developmer	nt Index to calculate		
		the life expectancy index,	which is the ratio of	the difference of the	e actual life		
		expectancy and a pre-sele	ected minimum, and	the range of pre- det	termined maximum		
		and minimum life expectancy (UNDP, 2007):					
		$index_{sd} = (s_d - s_{min})/(s_{max} - s_{min})$					
where sd is the orig		where sd is the original su	ub-component for dis	trict d, and smin and	smax are the		
		minimum and maximum	values, respectively, f	or each sub-compor	nent determined		
1		using data from both dist	ricts.				

Nkondze et al (2013)

Constructs:

Constructs in report of frameworks	Represented in list by	Coded text indicating relationship
Factors affecting vulnerability		No operationalized representative
Household vulnerability to climate		No operationalized representative
change		

Patterns of smallholder vulnerability

Constructs:

- Vulnerability IPCC
- Cluster pattern analysis

Constructs in report of frameworks	Represented in list by	Coded text indicating relationship
Vulnerability IPCC	Vulnerability IPCC	Directly represented
Exposure	Vulnerability IPCC	Climate vulnerability is considered
		as a function of expo- sure,
		sensitivity and coping/adaptive
		capacity (IPCC 2007).
Sensitivity (A)	Vulnerability IPCC	Climate vulnerability is considered
		as a function of expo- sure,
		sensitivity and coping/adaptive
		capacity (IPCC 2007).
Adaptive capacity (C)	Vulnerability IPCC	Climate vulnerability is considered
		as a function of expo- sure,
		sensitivity and coping/adaptive
		capacity (IPCC 2007).
Cluster pattern analysis	Cluster pattern analysis	Directly represented
Food security	Vulnerability IPCC	Therefore, we investigate as to
		whether there are typical
		characteristics of smallholder
		households that help to explain the
		causal structure of their
		vulnerability to weather extremes in
		relation to food security.

Operationalization of constructs				
-	Construct operationalized: Vulnerability IPCC			
Source article(s):				
Selected by:	expert selection [justification]		
Sub-constructs	Intermediate constructs			
	Directly operationalized constructs			
Conceptual framework				
Operationalization of sub-constructs				
86. •	Data collection			
	Operational questions			
	Sampling strategies			
	Sample sizes			
	Data analysis			
87. •	Data collection			
	Operational questions			
	Sampling strategies			
	Sample sizes			
	Data analysis			

88.	•	Data collection
		Operational questions
		Sampling strategies
		Sample sizes
		Data analysis
89.	•	Data collection
		Operational questions
		Sampling strategies
		Sample sizes
		Data analysis
Can	ididate-level	
Ana	alysis	

Oper	ationaliza	tion of constru	ucts			
-	Construct operationalized: Cluster Pattern analysis					
Sour	Source article(s): Sietz et al					
Selec	ted by:	default/expe	ert selection [justification]			
Sub-		Intermedia				
const	tructs	te				
		constructs				
		Directly				
		operationa				
		lized				
		constructs				
	eptual	DIRECT OPER	RATIONALIZATION			
	ework					
	ationaliz					
	of sub-					
	tructs	_				
90.		Data	The ALTAGRO (2006) data base contains detailed			
		collection	quantitative information for 527 smallholder households collected through			
			household questionnaires.			
			[]			
			The necessary weather information is available in good quality for the 1996–2006			
			period for two stations located in Puno and Cabanillas (see Fig. 1). Table 2 shows the average pre- cipitation and temperature for both stations.			
		Operation	Ten categories describe the smallholder households covering personal information			
		al	about the family members (e.g. occupation, education level, age), production			
		questions	systems (e.g. crop and livestock assets, labour input, processing and commer-			
		4	cialisation of produce), weather conditions, food reserves, income, some expenses			
			and credits.			
			[]			
			The following data are taken from the ALTAGRO			
			(2006) data base to indicate the mechanisms relevant in this study. As the first			
			dimension, the harvest failure risk is indicated by the number of production zones			
			used for crop and pasture cultivation. The indicator considers plains, hillsides and			
			hills. The second dimension of the area con- straint is measured by the crop area as			
			an important pre- requisite for food production. The pasture area highly correlates			
			to livestock keeping and is therefore reflected in the livestock measure. The third			
			dimension, the livestock constraint, is characterised by the number and types of			

-		species, we calculated s	
metabolism (Kleib	er 1961). Average l	e variety based on the l ivestock weights were	estimated using 20
-			Since fodder production
		keeping, the respective	
			nermore, the productivity
			food crops potatoes and
		productivity across spec n, we concentrate on fo	
		luded in the livestock r	
	-		f years that a household
			ling to the four levels: no
		/ and higher edu- catio	-
alternative income	e as the sixth dimer	ision is quantified by th	e sum of annual
monetary income	from local off-farm	activities and remittan	ices. People usually
receive remittance	es from household		
495			
		dependent labour, for e	
	1 summarises the ir	ndicators used to asses	s vulnerability.
[]	s of households' so	nsitivity and adaptive	1
		livestock constraints	
	-	is provided following	
	e description in tex		
ALTAGRO 2006)			
Dimension of	Indicator	Range	
sensitivity and			
adaptive			
capacity			
Harvest failure	Number of	1–3	
risk	production		
	zones used for		
	cultivation		
Area constraint	Crop area	0.1–1.3 ha/person ^a	
Livestock	Livestock units	0.1–8.0 livestock	
constraint		units/person	
Productivity	Potato	0.1–10.0 t/ha	
constraint	productivity	0.2–1.8 t/ha	
	Quinua		
Education:	productivity	1 4	
Education deprivation	Education level of household	1-4	
	head		
Lack of	Local off-farm	0–2400	
alternative	income and	Soles/year*person	
income	remittances		
a Average: 4 pers	sons per household		
	-		-
[]			
		available in good qual	-
period for two sta	tions located in Pur	no and Cabanillas (see F	ig. 1). Table 2 shows the

		average pre []	- cipit	ation	and te	empe	rature	for b	ooth s	statio	ns.				
		Table 2 Mean precipitation and temperature for 1996–2006 at Puno and Cabanillas stations (Data source: Servicio Nacional de Meteorologi´ae Hidrologi´a													
		del Peru´,		•								0			0 -
			Mea	in valu	ies for	1996	5–200	6		T	1	T	T	T	T
		n b ar pr ay n l g pt t v c a					Tot al								
		Precipita tion (mm)													
		Puno	20 1	16 1	13 8	60	7	3	4	14	27	51	48	88	80 1
		Cabanilla s	16 6	16 5	11 2	56	6	1	3	11	19	54	55	91	73 8
		Mean tempera ture (□C)													
		Puno	10. 8	10. 7	10. 6	9. 7	8.1	6. 8	6. 8	7. 9	9.3	10. 4	11. 0	11. 5	9.5
		Cabanilla s	10. 6	10. 5	10. 5	9. 8	8.6	7. 3	6. 9	8. 1	9.6	10. 6	11. 1	11. 3	9.6
		Minimu m tempera ture (C)													
		Puno	5.7	5.8	5.4	3. 8	0.8	- 0. 9	- 1. 1	0. 4	1.9	3.6	4.3	5.4	2.9
		Cabanilla s	5.3	5.5	5.2	3. 7	1.1	- 0. 8	- 1. 5	0. 3	2.1	3.7	4.2	5.1	2.8
	Sampling										ļ				
	strategies Sample sizes														
	Data analysis	The cluster exchange al (MacQueen reproducibi the algorith	gorith 1967 lity of	im, i.e ; RDC1 partit	., hclu F 2009 ions fe	ist an 9). Bas or a p	d kme sed on re-giv	ans, stoc	using hasti umbe	the s c initi r of c	tatisti alisati luster	cs pac on, we s to de	kage e calcu eterm	R ulated ine wl	the nethe
		households as "consiste results. We comparison consistency analysed. Fu	ency m calcul s of pa meas	neasur ated t artitio sure er	re''. Th he co ns wit nables	ne hig nsiste h a gi us to	her th ncy m iven n ident	nis me neasu umbe tify th	easur ire as er of o ne op	e, the the a cluste timal	more verag rs. Ult numb	e reliat e of 20 timate er of 0	ole the 00 pai ely, the cluster	e clust rwise e rs to b	er e
Candidate-		cluster appr RATIONALIZA	oach												

level Analysis		
	loval Analysis	
	level Analysis	

Livelihood trajectories and resilience and vulnerability

Constructs

- resilience and vulnerability of rural livelihoods

Constructs in report of frameworks	Represented in list by	Coded text indicating relationship
dynamic natural resource base	resilience and vulnerability of rural	
	livelihoods	
factors influencing resilience and	resilience and vulnerability of rural	
vulnerability	livelihoods	
livelihood trajectories	resilience and vulnerability of rural	
	livelihoods	
resilience and vulnerability of rural	resilience and vulnerability of rural	Directly represented
livelihoods	livelihoods	

Operationalization of	constructs	
Construct operational	zed: resilience and vulnerabi	lity of rural livelihoods
Source article(s):		
Selected by:	default	
Sub-constructs	Intermediate constructs	
	Directly operationalized constructs	dynamic natural resource base; factors influencing resilience and vulnerability; livelihood trajectories
Conceptual framework		
Operationalization of sub-constructs		
91. dynamic natural resource base	Data collection	Repeated vegetation and wild animal surveys were conducted before and after rains, and time-series sets of Landsat images and wild animal aerial count data records were collected from the Department of Surveys and Mapping and the Department of Wildlife and National Parks. Soil and climate data were collected from the Department of Surveys and Mapping and the Department of Meteorological Services, respectively (see Sallu [2007] for a more detailed outline of the methodology and data). Environmental change data were then analyzed in conjunction with livelihood trajectory results in order to elucidate the key dynamics of relationships between livelihoods and the natural resource base.
	Operational questions	2ndary data
	Sampling strategies	2ndary data
	Sample sizes	2ndary data
	Data analysis	Quantitative data sets were analyzed using multivariate
		statistics. Livelihood and environmental
		data were classified using cluster analysis, and
		correlations were tested using principal components

92.	factors influencing resilience and vulnerability	Data collection Operational questions Sampling strategies Sample sizes	analysis. Landsat images were classified using ERDAS Imagine V.9 software and landscape-level changes were detected from raster attribute comparison (see Sallu [2007] for a more detailed outline of data analysis procedures). Not Transparent			
93.	livelihood trajectories	Data analysisData collectionNot TransparentOperational questionsSampling strategiesSample sizesData analysis				
Candidate-levelData analysis was conducted throughout the period of information gathering this was at a descriptive level in order to note any trends in the data, but it progressed to a more detailed level as both qualitative and quant social and environmental information was drawn together. Qualitative data or through processes of indexing the data under emerging themes. This permitted the identification of the factors that played an important role in th construction of livelihood strategies. Consistent triangulation of the results highlighted any contradictions and similarities in the different data sources. N contradictions were found, further iterative reflection took place in the form groups in order to ascertain why and how the conflicts in information may had occurred. This became a circular process that led to inductive interpretation explanation as the ecological information was gradually juxtaposed within th emergent socioeconomic context.Quantitative data were classified using cluster analysis, and correlations w using principal components analysis. Landsat images were classified using ERDAS Imagine V.9 software and landscape-level changes were detected for attribute comparison (see Sallu [2007] for a more detailed outline of data an procedures). Based on this analysis, we aimed to identify contemporary strategies and the nature of trajectories to which they led. In doing this, we a identified the key changes to the vulnerability context and the combination of combination of the set o						

Determinants of Resilience

Constructs:

- Vulnerability IPCC
- Household level resilience
- Determinants of resilience

Constructs in report of frameworks	Represented in list by	Coded text indicating relationship
Vulnerability IPCC	Vulnerability IPCC	directly represented
Determinants of Resilience	Determinants of Resilience	directly represented
Household level resilience	Household level resilience	directly represented
Exposure	Vulnerability IPCC	In this regard, vulnerability is a function of the character, magnitude, and rate of climate variation to which a system is ex- posed, its sensitivity, and its adaptive capacity [4].
Adaptive capacity (A);	Vulnerability IPCC	In this regard, vulnerability is a function of the character, magnitude, and rate of climate variation to which a system is exposed, its sensitivity, and its adaptive capacity [4].

Operationalization of co	Operationalization of constructs		
Construct operationalize	Construct operationalized: Vulnerability IPCC		
Source article(s):			
Selected by:	expert selection [justifica	tion]	
Sub-constructs	Intermediate constructs Directly operationalized		
	constructs		
Conceptual framework			
Operationalization of			
sub-constructs			
94. •	Data collection		
	Operational questions		
	Sampling strategies		
	Sample sizes		
	Data analysis		
95. •	Data collection		
	Operational questions		
	Sampling strategies		
	Sample sizes		
	Data analysis		

96.	•	Data collection
		Operational questions
		Sampling strategies
		Sample sizes
		Data analysis
97.	•	Data collection
		Operational questions
		Sampling strategies
		Sample sizes
		Data analysis
Car	ndidate-level	
Ana	alysis	

Operationalization of co	onstructs	
Construct operationalize	ed: Household level resilie	ence
Source article(s): Tesso	et al (2012)	
Selected by:	default	
Sub-constructs	Intermediate constructs Directly operationalized	
	constructs	
Conceptual framework	DIRECT OPERATIONALIZ	ATION
Operationalization of sub-constructs		
98. •	Data collection	The data for the research was obtained from a survey of 452 farm households in three districts of the Zone in 2011/2012. [] A structured ques- tionnaire was used to interview the farmers. [] In addition, secondary data relevant for this analysis was obtained from the National Meteorological Service Agency (NMSA), Central Statistical Authority (CSA), and Zonal and district agricultural offices. In order to understand the research questions at community level, qualitative data were collected through focused group discussion using checklist prepared for the purpose.
	Operational questions	Data collected from the farmers include household characteristics, landholding, crops and livestock production, disaster occurrence, perception level (on precipitation, temperature, soil moisture, air moisture and wind direction), adaptation strategies pursued, different coping strategies pursued, level of resilience, and other relevant informa- tion. [] Table 1. Social, economic and environmental vulnerability indicators for the study area. I. Social Vulnerability Variables Sex: Female headed

Education: illiterate and less than grade 2
Marital status: Single (including divorce and widow)
No. of relatives: relative to less than 5 households
No. institutions: Participation in less than 2.35 institutions
Dependency: High dependency of 4 person and more
Farm to farm ext: No access to farmer to farmer extension
Year Ag. Experience: Lack of farm experience if < 3 years
Access to indigenous early warning information: Having no access
II. Economic Vulnerability Variables
n. Economic vulnerability variables
Livestock ownership: Own less than 2 tropical livestock
unit
Access to information: Having no access to
Ownership of perennial crops: no area under perennial
crops
Land size: own less than 0.5ha of land
Land fragmentation: own only one plots
Non-farm income: Have no non-farm income
Soil and water conservation structures: More than 50% is
not conserved
Income level: Having less than minimum requirement
Consumption expenditure: Spending less than minimum
requirement
Crop diversity: less than 50% of the 8 major crops grown in the area
Land under irrigation: no access to irrigation at all
Land under improved seed: area not covered with
improved seed (average of high yielding, drought
tolerant, early maturing)
Land under commercial fertilizer: Having no access to
fertilizer at all
Cash reserve: Having no cash saving at all
Food reserve: Having no food reserve for next year
Credit: Having no access to credit at all
III. Environmental Vulnerability Variables (Measures of
Sensitivity and Exposure)
Land topography: Slope greater than 15% and 0% slope
Fertility: Poor fertility and cannot produce without heavy
fertilizer use
Vegetation cover: Bare land
Frequency of hazards: People facing more than two
natural hazards in a year
Rainfall: Receiving below average
Temperature: Experiencing above average
remperature. Experiencing above average
Change in wind direction: Encountering change in wind
Change in wind direction: Encountering change in wind direction than usual

	Sampling strategies	based on a m Consequently	ulti stage 1, 19 Kebe 1ere selec	s within the di random sam- eles were sele cted ran- dom	 pling proced cted from whi 	ure. ich the sample
	Sample sizes	452 farm hou	seholds i	n three distric	ts of the Zone	2
	Data analysis	In this analys categories: 1) which means agricultural o moderate in l took one to t operation as which means within one to livelihood act fully bounced time before t measured by back to their government o [] Table 3 prese variables of r analysis resul bounce back	is, the lev househo peration pouncing wo agricu before th househo two agri ivities. In l back, wh he shock number livelihood or non- ge nts the st esilience t, the tim after clim	vel of resilience olds that were ilds that have in the followin back; which n iltural seasons ie event; and a ilds which wer cultural season this research, nen it begins if of agricul- tura d without exter overnmental co tatistical meas in the study a ne taken to	e was classifie fast in bounci gone back to t ng production neans househ to get back to bour in bour e unable to bo ns to their nor a farmer is sa ts lively- hood bouncing bac al seasons take rnal intervent organization. sure of the diff rea. From the duced shocks	d into three ing back; their normal season; 2) olds which o normal ncing back; ounce back rmal aid to have operation as ck was en to bounce tion by
		Table 3. Statistical values of factors of resilience to climate				
		change indu	iced shoc			
		Variables	Mean	Maximum	Minimum	St Deviation
		Time taken to bounce back (Agr. seasons)	3	4	1	1.3898
		Source: Own 2011/2012.	n comput	ation from ho	usehold surve	ey of
Candidate-level Analysis	DIRECT OPERATIONALI	ZATION				

Operationalization of constructs			
Construct operationalized: Determinants of resilience			
Source article(s): Tesso et al (2012)			
Selected by:	default	default	
Sub-constructs	Intermediate		
	constructs		
	Directly operationalized		

	constructs	
Conceptual framework	DIRECT OPERATIONALIZ	ATION
Operationalization of		
sub-constructs		
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		Livestock ownership: Own less than 2 tropical livestock unit Access to information: Having no access to Ownership of perennial crops: no area under perennial crops Land size: own less than 0.5ha of land Land fragmentation: own only one plots Non-farm income: Have no non-farm income Soil and water conservation structures: More than 50% is

	not conserved
	Income level: Having less than minimum requirement
	Consumption expenditure: Spending less than minimum
	requirement
	Crop diversity: less than 50% of the 8 major crops grown
	in the area
	Land under irrigation: no access to irrigation at all
	Land under improved seed: area not covered with
	improved seed (average of high yielding, drought
	tolerant, early maturing)
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	fertilizer at all
	Cash reserve: Having no cash saving at all
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	Vegetation cover: Bare land
	Frequency of hazards: People facing more than two
	natural hazards in a year
	Rainfall: Receiving below average
	Temperature: Experiencing above average
	Change in wind direction: Encountering change in wind
	direction than usual
Sampling strategies	The specific study sites within the dis- tricts were selected
	he and an a would be an unit of an and an unit of the second sure
	based on a multi stage random sam- pling procedure.
	Consequently, 19 Kebeles were selected from which the
	Consequently, 19 Kebeles were selected from which the
Sample sizes	Consequently, 19 Kebeles were selected from which the sample households were selected ran- domly proportional to
Sample sizes Data analysis	Consequently, 19 Kebeles were selected from which the sample households were selected ran- domly proportional to population size.
	 Consequently, 19 Kebeles were selected from which the sample households were selected ran- domly proportional to population size. 452 farm households in three districts of the Zone
	 Consequently, 19 Kebeles were selected from which the sample households were selected ran- domly proportional to population size. 452 farm households in three districts of the Zone Ordered probit regression model was used to iden-
	 Consequently, 19 Kebeles were selected from which the sample households were selected ran- domly proportional to population size. 452 farm households in three districts of the Zone Ordered probit regression model was used to identify and analyze the determinants of households' re- silience
·	 Consequently, 19 Kebeles were selected from which the sample households were selected ran- domly proportional to population size. 452 farm households in three districts of the Zone Ordered probit regression model was used to identify and analyze the determinants of households' re- silience to climate change induced shocks.
	 Consequently, 19 Kebeles were selected from which the sample households were selected ran- domly proportional to population size. 452 farm households in three districts of the Zone Ordered probit regression model was used to iden-tify and analyze the determinants of households' re- silience to climate change induced shocks. []
	 Consequently, 19 Kebeles were selected from which the sample households were selected ran- domly proportional to population size. 452 farm households in three districts of the Zone Ordered probit regression model was used to identify and analyze the determinants of households' re- silience to climate change induced shocks. [] comparison was done based on certain defined characteristics. Thus, resilience in this measurment involved
ł	 Consequently, 19 Kebeles were selected from which the sample households were selected ran- domly proportional to population size. 452 farm households in three districts of the Zone Ordered probit regression model was used to identify and analyze the determinants of households' re-silience to climate change induced shocks. [] comparison was done based on certain defined characteristics. Thus, resilience in this measurment involved ordered out- come. This is with the basic hypothesis that a
· · ·	 Consequently, 19 Kebeles were selected from which the sample households were selected ran- domly proportional to population size. 452 farm households in three districts of the Zone Ordered probit regression model was used to identify and analyze the determinants of households' re- silience to climate change induced shocks. [] comparison was done based on certain defined characteristics. Thus, resilience in this measurment involved ordered out- come. This is with the basic hypothesis that a given natural shock will have differencial impact on house-
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•	Consequently, 19 Kebeles were selected from which the sample households were selected ran- domly proportional to population size.452 farm households in three districts of the ZoneOrdered probit regression model was used to iden- tify and analyze the determinants of households' re- silience to climate change induced shocks.[]comparison was done based on certain defined characteristics. Thus, resilience in this measurment involved ordered out- come. This is with the basic hypothesis that a given natural shock will have differencial impact on house- holds' resilience. $Y_j^* = X_{1j}^1B + U_{1j}$ $Y = 0$ if $Y^* < 0$ $Y = 1$ if $0 < Y^* < 1$ $Y = 2$ if $1 < Y^* < 2$
· · ·	Consequently, 19 Kebeles were selected from which the sample households were selected ran- domly proportional to population size.452 farm households in three districts of the ZoneOrdered probit regression model was used to iden- tify and analyze the determinants of households' re- silience to climate change induced shocks.[]comparison was done based on certain defined characteristics. Thus, resilience in this measurment involved ordered out- come. This is with the basic hypothesis that a given natural shock will have differencial impact on house- holds' resilience. $Y_j^* = X^1_j B + U_{1j}$ $Y = 0$ if $Y^* < 0$ $Y = 1$ if $0 < Y^* < 1$ $Y = 2$ if $1 < Y^* < 2$ Y^* is level of resilience and involves ordered outcome, that is
i	Consequently, 19 Kebeles were selected from which the sample households were selected ran- domly proportional to population size.452 farm households in three districts of the ZoneOrdered probit regression model was used to iden- tify and analyze the determinants of households' re- silience to climate change induced shocks.[]comparison was done based on certain defined characteristics. Thus, resilience in this measurment involved ordered out- come. This is with the basic hypothesis that a given natural shock will have differencial impact on house- holds' resilience. $Y_j^* = X_{1j}^1B + U_{1j}$ $Y = 0$ if $Y^* < 0$ $Y = 1$ if $0 < Y^* < 1$ $Y = 2$ if $1 < Y^* < 2$

Appendix O: Results – Framework summaries, constructs, and operationalizations

Asset vulnerability

Framework summary		
Name of framework: Asse	et vulnerability	
Description of framework		
		to climate change in terms of the management control that can
	-	clude labour, human capital, non-labour productive assets,
		ity index is created through a framework of weighted indicators
representing each type of	-	
Key constructs and defini		
Household vulnerability to		FINED
		erability framework as guidance, we selected a range of
		lity from GLSS 4. Each variable captures an aspect of
vulnerability. (Dasgupta &		ity nom 0155 4. Each variable captares an aspect of
	e basilieri zorzy	
Future exposure: Future e	exposure also includes est	imating the future state of the socioeconomic conditions, given
that exposure is a propert	-	
Communities at risk of cli		
Welfare of rural househol		-
Prepared for adverse cons		
Ideal type model:		
Not enough defined const	tructs to generate model.	
	: (Dasgupta & Bashieri 20)	12)
Operationalization of key		
operationalization of key	constructs.	
Operationalization of co	onstructs	
	ed: Household vulnerabili	ty to climate change
Source article(s): Dasgu		
Source article(s). Dasgu		
Selected by:	default	
Sub-constructs	Intermediate	Asset vulnerability
	constructs	
	Directly	Labour; human capital; non-labour productive assets; social
	operationalized	capital
	constructs	
Conceptual framework	Using the GLSS 4, we ap	oplied the asset vulnerability framework developed by Moser
		constructed an index of vulnerability to climate change, at the
	household level.	
	The first asset Moser id	entified is labour
	[]	
	[] The second asset Mose	r (1998) identified is human capital.
	[] The second asset Mose []	r (1998) identified is human capital.
	[] The second asset Mose [] Non-labour productive	
	[] The second asset Mose [] Non-labour productive []	r (1998) identified is human capital. assets are the third type.
	[] The second asset Mose [] Non-labour productive [] Moser (1998) identified	r (1998) identified is human capital. assets are the third type.
	[] The second asset Mose [] Non-labour productive [] Moser (1998) identified []	r (1998) identified is human capital. assets are the third type. household relations
Operationalization of	[] The second asset Mose [] Non-labour productive [] Moser (1998) identified	r (1998) identified is human capital. assets are the third type. household relations

sub	-constructs			
-	Labour	Data collection	NOT valid/feasible	
	200001	Operational questions		
		Sampling strategies		
		Sample sizes		
		Data analysis		
101	human capital	Data collection	NOT valid/feasible	
101	numun cupitui	Operational questions		-
		Sampling strategies		
		Sample sizes		
		Data analysis		
		Sample sizes		
		Data analysis		
103	non-labour	Data collection	Wo used data colle	ected between April 1998 and March
102				round of the Ghana Living Standards
	productive assets			hich was funded by the World Bank and
				ana. The survey instruments were
				or poverty and well- being in Ghana. The
				formation on the demographic
				nousehold members, their reported
				cation, employment, housing and income
				ess activities and agricultural production
			-	ds of consumption and expenditure data.
				contained household-level information
				y-metric measures of poverty such as
				and expenditure (Coulombe and McKay,
			2000).	
		Operational questions	In order to measur	re the different degrees of productive
				buseholds we used the total number of
			productive assets	owned by the household as a proxy.
			Among reproducib	ole capital assets the questionnaire
			included furniture,	, sewing machines, stoves, refrigerator-
			freezers, air condit	tioners, fans, radios, radio-cassette
			players, record pla	ayers, three-in-one radio-cassette players,
			video equipment,	washing machines, TVs, cameras, electric
			irons, bicycles, mo	torcycles, cars, houses, land, shares,
			boats, canoes and	outboard motors. Each asset was
			weighted equally.	
			[]	
			Table 2	
			ASSETS	Variable
			Productive	Number of productive asset (N¼3679)
			assets	
		Sampling strategies	TheGLSS4 is a two-	-stage probability-proportional-to-size
			sample.	
		Sample sizes	The sample contai	ns data for5998households, of which
				ral areas, with 25 694 eligible individual
				ers. We excluded the Greater Accra area
				, leaving 3679 rural households. In
				usehold survey, the GLSS 4 team
				numerator) administered a community
			questionnaire to c	ommunity leaders of the rural

1		enumeration areas that were surveyed. One questionnaire	
		was administered to each of the 195 rural enumeration	
		areas.	
	Data analysis	Table 4 shows the weight assigned to each variable derived	
	,	from the first principal	
		component. The data reduction that PCA performed on the	
		data explained 25 per cent of the original variation of the	
		data. The PCA factor loadings were examined, and the	
		principal component tended to load	
		positively on variables which contributed to lower	
		vulnerability such as better education and better health,	
		and negatively on variables which contributed to higher	
		household vulnerability such as higher percentage of	
		household income from agriculture. Therefore, the score is	
		a measure of 'strength' or preparedness. A high score	
		indicates a non-vulnerable household, and a low score	
400		indicates a vulnerable household.	
103 social capital	Data collection	NOT VALID/FEASIBLE	
	Operational questions		
	Sampling strategies		
	Sample sizes		
	Data analysis		
Candidate-level	Table 4 shows the weigh	t assigned to each variable derived from the first principal	
Analysis	component. The data reduction that PCA performed on the data explained 25 per		
	cent of the original varia	tion of the data. The PCA factor loadings were examined, and	
	the principal component	tended to load	
	positively on variables w	hich contributed to lower vulnerability such as better	
		alth, and negatively on variables which contributed to higher	
		such as higher percentage of household income from	
	-	ne score is a measure of 'strength' or preparedness. A high	
	_	Inerable household, and a low score indicates a vulnerable	
	household.		
Operationalization of co	Instructs		
Operationalization of co			
Construct operationalize	ed: Future Exposure		
Construct operationalize Source article(s): NO TR	ed: Future Exposure	T) OR VALID (DASGUPTA & BASHCIERI)	
Construct operationalize Source article(s): NO TR OPERATIONALIZATION	ed: Future Exposure ANSPARENT (FORD & SMI	T) OR VALID (DASGUPTA & BASHCIERI)	
Construct operationalize Source article(s): NO TR OPERATIONALIZATION Selected by:	ed: Future Exposure ANSPARENT (FORD & SMI default	T) OR VALID (DASGUPTA & BASHCIERI)	
Construct operationalize Source article(s): NO TR OPERATIONALIZATION	ed: Future Exposure ANSPARENT (FORD & SMI default Intermediate	T) OR VALID (DASGUPTA & BASHCIERI)	
Construct operationalize Source article(s): NO TR OPERATIONALIZATION Selected by:	ed: Future Exposure ANSPARENT (FORD & SMI default Intermediate constructs	T) OR VALID (DASGUPTA & BASHCIERI)	
Construct operationalize Source article(s): NO TR OPERATIONALIZATION Selected by:	ed: Future Exposure ANSPARENT (FORD & SMI default Intermediate constructs Directly	T) OR VALID (DASGUPTA & BASHCIERI)	
Construct operationalize Source article(s): NO TR OPERATIONALIZATION Selected by:	ed: Future Exposure ANSPARENT (FORD & SMI default Intermediate constructs	T) OR VALID (DASGUPTA & BASHCIERI)	
Construct operationalize Source article(s): NO TR OPERATIONALIZATION Selected by:	ed: Future Exposure ANSPARENT (FORD & SMI default Intermediate constructs Directly	T) OR VALID (DASGUPTA & BASHCIERI)	
Construct operationalize Source article(s): NO TR OPERATIONALIZATION Selected by:	ed: Future Exposure ANSPARENT (FORD & SMI default Intermediate constructs Directly operationalized	T) OR VALID (DASGUPTA & BASHCIERI)	
Construct operationalize Source article(s): NO TR OPERATIONALIZATION Selected by: Sub-constructs	ed: Future Exposure ANSPARENT (FORD & SMI default Intermediate constructs Directly operationalized	T) OR VALID (DASGUPTA & BASHCIERI)	
Construct operationalize Source article(s): NO TR OPERATIONALIZATION Selected by: Sub-constructs Conceptual framework	ed: Future Exposure ANSPARENT (FORD & SMI default Intermediate constructs Directly operationalized	T) OR VALID (DASGUPTA & BASHCIERI)	
Construct operationalize Source article(s): NO TR OPERATIONALIZATION Selected by: Sub-constructs Conceptual framework Operationalization of	ed: Future Exposure ANSPARENT (FORD & SMI default Intermediate constructs Directly operationalized constructs	T) OR VALID (DASGUPTA & BASHCIERI)	
Construct operationalize Source article(s): NO TR OPERATIONALIZATION Selected by: Sub-constructs Conceptual framework Operationalization of sub-constructs	ed: Future Exposure ANSPARENT (FORD & SMI default Intermediate constructs Directly operationalized constructs Data collection	T) OR VALID (DASGUPTA & BASHCIERI)	
Construct operationalize Source article(s): NO TR OPERATIONALIZATION Selected by: Sub-constructs Conceptual framework Operationalization of sub-constructs	ed: Future Exposure ANSPARENT (FORD & SMI default Intermediate constructs Directly operationalized constructs Data collection Operational questions	T) OR VALID (DASGUPTA & BASHCIERI)	
Construct operationalize Source article(s): NO TR OPERATIONALIZATION Selected by: Sub-constructs Conceptual framework Operationalization of sub-constructs	ed: Future Exposure ANSPARENT (FORD & SMI default Intermediate constructs Directly operationalized constructs Data collection Operational questions Sampling strategies	T) OR VALID (DASGUPTA & BASHCIERI)	
Construct operationalize Source article(s): NO TR OPERATIONALIZATION Selected by: Sub-constructs Conceptual framework Operationalization of sub-constructs	ed: Future Exposure ANSPARENT (FORD & SMI default Intermediate constructs Directly operationalized constructs Data collection Operational questions Sampling strategies Sample sizes	T) OR VALID (DASGUPTA & BASHCIERI)	
Construct operationalize Source article(s): NO TR OPERATIONALIZATION Selected by: Sub-constructs Conceptual framework Operationalization of sub-constructs	ed: Future Exposure ANSPARENT (FORD & SMI default Intermediate constructs Directly operationalized constructs Data collection Operational questions Sampling strategies	T) OR VALID (DASGUPTA & BASHCIERI)	

	Operational questions	
	Sampling strategies	
	Sample sizes	
	Data analysis	
106 •	Data collection	
	Operational questions	
	Sampling strategies	
	Sample sizes	
	Data analysis	
107 •	Data collection	
	Operational questions	
	Sampling strategies	
	Sample sizes	
	Data analysis	
Candidate-level		
Analysis		

Information relating to further development of framework

Constructs with no adequate operationalizations NO ADEQUATE OPERATIONALIZATIONS:

- Communities at risk of climate shocks (no operationalizations)
- Welfare of rural households (no operationalizations)
- Prepared for adverse consequences (no operationalizations)
- Future Exposure (no adequate operationalization)
- Household vulnerability to climate change (partial operationalization)

Constructs with more than one adequate operationalizations

Construct	Preference rank	Summary of operationalization

Current and future vulnerability

Framework summary

Name of framework: Current and future vulnerability

Description of framework:

The main characteristics of this framework is its comparison of current and future states of vulnerability. Vulnerability is conceived as being composed of two principal elements: exposure to climatic changes, and adaptive capacity. Multiple data sources are used to generate an assessment of current exposure and current adaptive capacity. On the basis of this data, and on historical social and physical trends, projections are made as to likely future states of exposure and future states of adaptive capacity.

Key constructs and definitions:

<u>Vulnerability to climate risks</u>: The conceptual model of community vulnerability to climate change outlined here builds on the literature, conceptualizing vulnerability as a function of exposure of the community to climate-change effects and its adaptive capacity to deal with that exposure.

[...]

A research framework for empirically applying the model of vulnerability proposed above to Arctic communities is illustrated in Figure 3. The first stage assesses current vulnerability by documenting current exposures and current adaptive strategies. The second stage assesses future vulnerability by estimating directional changes in exposure and predicting future adaptive capacity on the basis of past behavior. (Ford & Smit 2004)

<u>Current vulnerability</u>: The assessment of current vulnerability requires analyzing and documenting communities' experiences with climatic risks (current exposure) and the adaptive options and resource management strategies employed to address these risks (current adaptive capacity). **(Ford & Smit 2004)**

<u>Future vulnerability</u>: Future vulnerability is assessed by analyzing how cli- mate change will alter the nature of the climate-related risks and whether the communities' coping strategies will have the capacity to deal with these risks. Assessing future exposure involves collaboration with the climate science community to estimate the likelihood of changes in climatic attributes identified by the community (Ford & Smit 2004)

<u>Current adaptive capacity</u>: Adaptive capacity refers to a community's potential or ability to address, plan for, or adapt to exposure (Smit and Pilifosova, 2003). Most communities can cope with normal climatic conditions and a range of deviations around norms. People have learned to modify their behaviour and their environment to manage and take advantage of their local climatic conditions (Jones and Boer, 2003). This ability to cope is referred to in the literature as the "coping range"; it reflects resource use options and risk management strategies to prepare for, avoid or moderate, and recover from exposure effects (Hewitt and Burton, 1971; Smit et al., 1999; Jones, 2001; Smit and Pilifosova, 2003). Adaptive capacity relates to communities' resilience, resistance, flexibility, and robustness (Smithers and Smit, 1997). It is influenced by economic wealth, social networks, infrastructure, social in- stitutions, social capital, experience with previous risk, the range of technological adaptation available, and equity of access to resources within the community, as well as by other stresses that contribute to the environment in which decisions are made (Adger and Kelly, 1999; Smit and Pilifosova, 2001; Smith et al., 2003). **(Ford & Smit 2004)**

Exposure: The nature and degree to which a system is exposed to significant climatic variations. The exposure of a system to climate stimuli depends on the level of global cli- mate change and, due to the spatial heterogeneity of anthropogenic climate change, on the system's location (Fussel & Klein 2006) Future exposure: Future exposure also includes estimating the future state of the socioeconomic conditions, given that exposure is a property of the system relative to risk. (Ford & Smit 2004)

Ideal type model: (uneven)

	Vulnerability to climate risks			
Curren vulnerab y	ilit) (vulne	ture erabili iy		
Ada	rent ptive acity			
Articles using framework	:: (Ford & Smit 2004)	<u></u>		
Operationalization of key	1 /			
•				
Operationalization of c	onstructs			
Construct operationaliz	ed: Vulnerability to climate	risks		
Source article(s): Ford 8	& Smit (2004); Dasgupta & b	ashieri		
Colorito d huu	defeult			
Selected by:	default	forte une conclusioner le titte e		
Sub-constructs	Intermediate	future vulnerability		
	constructs	Current vulnerability Euture evnesure, future adentive		
	Directly	Current vulnerability; Future exposure; future adaptive		
	operationalized constructs	capacity		
Concontual framowork		r ompirically applying the model of yulperability proposed		
Conceptual framework		or empirically applying the model of vulnerability proposed		
	above to Arctic commu- nities is illustrated in Figure 3. The first stage assesses current vulnerability by documenting current exposures and current adaptive strategies. The			
	second stage assesses future vulnerability by estimating directional changes in			
	exposure and predicting future adaptive capacity on the basis of past behavior.			
	FIG. 3. Analytical framework for vulnerability assessment.			
	Future Exposure			
	Future Vulnerability			
	Future Adaptive Capacity			
Operationalization of				
sub-constructs				
108 Current	Data collection	NOT TRANSPARENT		
vulnerability	Operational questions			
	Sampling strategies			
	Sample sizes			
	Data analysis			
109 Future exposure	Data collection	NOT TRANSPARENT (Ford & Smit); Not Valid (Dasgupta &		

			bashieri)
		Operational questions	
		Sampling strategies	
		Sample sizes	
		Data analysis	
110	future adaptive	Data collection	NOT TRANSPARENT
	capacity	Operational questions	
		Sampling strategies	
		Sample sizes	
		Data analysis	
111	•	Data collection	
		Operational questions	
		Sampling strategies	
		Sample sizes	
		Data analysis	
Can	didate-level		
Ana	llysis		

Information I	relating to further de	velopment of framework
Constructs wi	ith no adequate oper	ationalizations:
NO ADEQUAT	TE OPERATIONALIZAT	IONS
Constructs wi	ith more than one ad	equate operationalizations
Construct	Preference rank	Summary of operationalization

Determinants of Resilience

Framework summary

Name of framework: Determinants of Resilience

Description of framework:

The focus is on identifying determinants of resilience to climate-related shocks. Resilience is conceptualised temporally in terms of the time taken to make a recovery after being impacted by shocks. A vulnerability index (in this case based on the framework of the IPCC) is created to compute measures of vulnerability based on household survey data. Classifications of resilience are then created based on the time taken to return to pre-shock states, which are then analysed against the vulnerability data to identify determinants of resilient households.

Key constructs and definitions:

<u>Vulnerability IPCC</u>: The degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate variation to which a system is exposed, its sensitivity, and its adaptive capacity. **(Fussel & Klein 2006)**

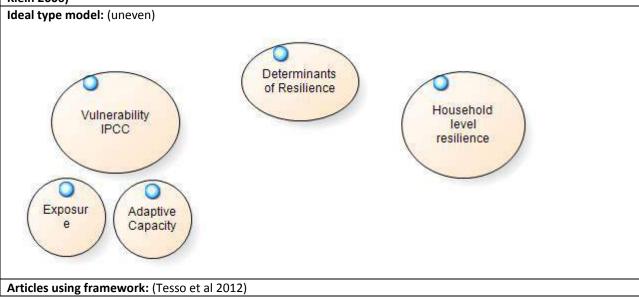
<u>Determinants of Resilience</u>: important determinants for resilience at household level in North Shewa zone of Ethiopia. **(Tesso et al 2012)**

<u>Household level resilience</u>: According to DFID, resilience at community level is explained as the ability of countries, communities and households to manage change, by maintaining or transforming living standards in the face of shocks or stresses—such as earthquakes, drought or violent conflict—without compromising their long- term prospects [10]. Similarly, resilience is the ability of a social or ecological system to absorb disturbances while retaining the same basic structure and ways of functioning, the capacity for self-organization, and the capacity to adapt to stress and change. This is a measurement of community's capacity to absorb external shocks. In the aftermath of occurrence of climate change induced shocks, how do farmer bounce back to normal livelihood is about the resilience level of farming com- munity. A resilient community is able to respond to changes or stress in a positive way, and is able to maintain its core functions as a community despite those stresses [11]. **(Tesso et al 2012)**

Exposure: The nature and degree to which a system is exposed to significant climatic variations.

The exposure of a system to climate stimuli depends on the level of global cli- mate change and, due to the spatial heterogeneity of anthropogenic climate change, on the system's location (Fussel & Klein 2006)

<u>Adaptive capacity</u>: The ability of a system to adjust to climate change (in- cluding climate variability and extremes) to moderate potential damages, to take advantage of opportunities, or to cope with the consequences. **(Fussel & Klein 2006)**



Operationalization of co		
Construct operationaliz	ed: Vulnerability IPCC	
Source article(s):		
Selected by:	expert selection [justification]	
Sub-constructs	Intermediate	
	constructs	
	Directly	
	operationalized	
	constructs	
Conceptual framework		
Operationalization of		
ub-constructs		
112 •	Data collection	
	Operational questions	
	Sampling strategies	
	Sample sizes	
	Data analysis	
•	Data collection	
	Operational questions	
	Sampling strategies	
	Sample sizes	
	Data analysis	
•	Data collection	
	Operational questions	
	Sampling strategies	
	Sample sizes	
	Data analysis	
L15 •	Data collection	
	Operational questions	
	Sampling strategies	
	Sample sizes	
	Data analysis	
Candidate-level		
Analysis		
Operationalization of co		
-	ed: Household level resilience	
Source article(s): Tesso	st al (2012)	
Selected by:	default	
Sub-constructs	Intermediate	
	constructs	
	Directly	
	operationalized	
	constructs	
Conceptual	DIRECT OPERATIONALIZATION	

sub-constructs		
116 •	Data collection	The data for the research was obtained from a survey of 452 farm households in three districts of the Zone in
		2011/2012.
		[]
		A structured ques- tionnaire was used to interview the
		farmers.
		[]
		In addition, secondary data relevant for this analysis
		was obtained from the National Meteorological Service Agency
		(NMSA), Central Statistical Authority (CSA), and Zonal and
		district agricultural offices.
		In order to understand the research questions at community
		level, qualitative data were collected through focused group
	Onerational	discussion using checklist prepared for the purpose.
	Operational	Data collected from the farmers include household characteristics, landholding, crops and livestock production,
	questions	disaster occurrence, perception level (on precipitation,
		temperature, soil moisture, air moisture and wind direction),
		adaptation strategies pursued, different coping strategies
		pursued, level of resilience, and other relevant informa- tion.
		[]
		Table 1. Social, economic and environmental
		vulnerability indicators for the study area.
		I. Social Vulnerability Variables
		Sex: Female headed
		Education: illiterate and less than grade 2
		Marital status: Single (including divorce and widow)
		No. of relatives: relative to less than 5 households
		No. institutions: Participation in less than 2.35
		institutions Dependency: High dependency of 4 person and more
		Farm to farm ext: No access to farmer to farmer
		extension
		Year Ag. Experience: Lack of farm experience if < 3 years
		Access to indigenous early warning information: Having
		no access
		II. Economic Vulnerability Variables
		Livestock ownership: Own less than 2 tropical livestock unit
		Access to information: Having no access to
		Ownership of perennial crops: no area under perennial
		crops
		Land size: own less than 0.5ha of land
		Land fragmentation: own only one plots
		Non-farm income: Have no non-farm income
		Soil and water conservation structures: More than 50% is
		not conserved
		Income level: Having less than minimum requirement
1		Consumption expenditure: Spending less than minimum

		requirement
		requirement Crop diversity: less than 50% of the 8 major crops grown in the area Land under irrigation: no access to irrigation at all Land under improved seed: area not covered with improved seed (average of high yielding, drought tolerant, early maturing) Land under commercial fertilizer: Having no access to fertilizer at all Cash reserve: Having no cash saving at all Food reserve: Having no food reserve for next year Credit: Having no access to credit at all III. Environmental Vulnerability Variables (Measures of Sensitivity and Exposure) Land topography: Slope greater than 15% and 0% slope Fertility: Poor fertility and cannot produce without heavy fertilizer use
		Vegetation cover: Bare land Frequency of hazards: People facing more than two natural hazards in a year Rainfall: Receiving below average Temperature: Experiencing above average
		Change in wind direction: Encountering change in wind direction than usual
S	ampling strategies	The specific study sites within the dis- tricts were selected based on a multi stage random sam- pling procedure. Consequently, 19 Kebeles were selected from which the sample households were selected ran- domly proportional to population size.
S	Sample sizes	452 farm households in three districts of the Zone
	ample sizes Data analysis	452 farm households in three districts of the Zone In this analysis, the level of resilience was classified into three categories: 1) households that were fast in bouncing back; which means households that have gone back to their normal agricultural operation in the following production season; 2) moderate in bouncing back; which means households which took one to two agricultural seasons to get back to normal operation as before the event; and 3) slow in bouncing back; which means households which were unable to bounce back within one to two agricultural seasons to their normal livelihood activities. In this research, a farmer is said to have fully bounced back, when it begins its lively- hood operation as time before the shock. The speed of bouncing back was measured by number of agricul- tural seasons taken to bounce back to their livelihood without external intervention by government or non- governmental organization. [] Table 3 presents the statistical measure of the different variables of resilience in the study area. From the statistical analysis result, the time taken to

		bounce back	after clin	nate change ir	duced shocks	ranges from	
		bounce back after climate change induced shocks ranges from 1 agricultural year to more than 5 years []					
		Table 3. Statistical values of factors of resilience to climate change induced shocks.				to climate	
		Variables	Mean	Maximum	Minimum	St Deviation	
		Time	3	4	1	1.3898	
		taken to	5	4	1	1.3656	
		bounce					
		back (Agr.					
		seasons)					
			n comnu	L tation from ho	L Susehold surv	l ev of	
		Source: Own computation from household survey of 2011/2012.					
		2011,2012.					
Candidate-level	DIRECT OPERATIONALIZ	ATION					
Analysis							
Operationalization of co	onstructs						
•	ed: Determinants of resili	ence					
Source article(s): Tesso							
Selected by:	default						
Sub-constructs	Intermediate						
	constructs						
	Directly						
	operationalized						
	constructs						
Conceptual framework	DIRECT OPERATIONALIZ	ZATION					
Operationalization of							
sub-constructs							
117 •	Data collection	The data for the research was obtained from a survey of					
		452 farm households in three districts of the Zone in					
		2011/2012.					
		[]	A structured ques- tionnaire was used to interview the				
		farmers.					
		In addition, secondary data relevant for this analysis					
		was obtained from the National Meteorological Service					
		Agency (NMSA), Central Statistical Authority (CSA), and Zona					
		and district agricultural offices.					
		In order to understand the research questions at community					
			level, qualitative data were collected through focused group				
		-		ecklist prepare	-		
	Operational questions			n the farmers			
				idholding, cro			
				e, perception		-	
		-		moisture, air n			
	<u> </u>	airection),	auaptatio	on strategies p	ursuea, aittei	ent coping	

strategies pursued, level of resilience, and other relevant
informa- tion.
[]
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vulnerability indicators for the study area.
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No. institutions: Participation in less than 2.35
institutions
Dependency: High dependency of 4 person and more
Farm to farm ext: No access to farmer to farmer
extension
Year Ag. Experience: Lack of farm experience if < 3 years
Access to indigenous early warning information: Having
no access
II. Economic Vulnerability Variables
Livestock ownership: Own less than 2 tropical livestock
unit
Access to information: Having no access to
Ownership of perennial crops: no area under perennial
crops
Land size: own less than 0.5ha of land
Land fragmentation: own only one plots
Non-farm income: Have no non-farm income
Soil and water conservation structures: More than 50% is
not conserved
Income level: Having less than minimum requirement
Consumption expenditure: Spending less than minimum
requirement
Crop diversity: less than 50% of the 8 major crops grown
in the area
Land under irrigation: no access to irrigation at all
Land under improved seed: area not covered with
improved seed (average of high yielding, drought
tolerant, early maturing)
Land under commercial fertilizer: Having no access to
fertilizer at all
Cash reserve: Having no cash saving at all
Food reserve: Having no food reserve for next year
Credit: Having no access to credit at all
III. Environmental Vulnerability Variables (Measures of
Sensitivity and Exposure)
Land tanggraphy Clone greater than 15% and 0% clone
Land topography: Slope greater than 15% and 0% slope
Fertility: Poor fertility and cannot produce without heavy
fertilizer use
Vegetation cover: Bare land

		Frequency of hazards: People facing more than two natural hazards in a year Rainfall: Receiving below average Temperature: Experiencing above average Change in wind direction: Encountering change in wind direction than usual
	Sampling strategies	The specific study sites within the dis- tricts were selected based on a multi stage random sam- pling procedure. Consequently, 19 Kebeles were selected from which the sample households were selected ran- domly proportional to population size.
	Sample sizes	452 farm households in three districts of the Zone
	Data analysis	Ordered probit regression model was used to iden- tify and analyze the determinants of households' re- silience to climate change induced shocks. []
		comparison was done based on certain defined characteristics. Thus, resilience in this measurment involved ordered out- come. This is with the basic hypothesis that a given natural shock will have differencial impact on house- holds' resilience. $Y_j^* = X_j^1B + U_{1j}$ $Y = 0$ if $Y^* \leq 0$
		Y = 1 if $0 < Y^* < 1$ Y = 2 if $1 < Y^* < 2$ Y* is level of resilience and involves ordered outcome, that is
		Y = 0 was given to households taking more than two years to bounce back, Y = 1 was given households taking greater than one year and less than or equals to two years; and Y = 2, was given to households taking less than or equals to one year.
		The Xij are the explanatory variables determining the time taken to bounce back. The independent variables included in the model were avail- ability of food stock(dummy), income diversification (number of enterprises), number of plots, number of de- pendent family members, age of household
		 head (years), access to credit (dummy), social capital (number of in- stitutional involvement), area under perennia crops (ha), preparedness (dummy), propensity to invest on natural resources (percentage of area under conservation), pro- pensity to save (percentage of saving), access to irrigation (ha), geographic locations (dummy), etc. βs are pa-
		rameters estimated and Uij is the disturbance term.
Candidate-level Analysis	DIRECT OPERATIONALI	ZATION

Constructs with no adequate operationalizations ALL ADEQUATE		
Constructs with more than one adequate operationalizations		
Construct	Preference rank	Summary of operationalization
Vulnerability		
IPCC		

Intensifying vulnerability to food insecurity

Framework summary

Name of framework: Intensifying vulnerability to food insecurity

Description of framework:

Vulnerability is situated in a recursive framework which captures a cyclical nature of intensification of vulnerability principally through the negative impacts that coping strategies can have on food security. Vulnerability is conceived principally in terms of food security, which in turn is conceived in terms of access to food and food productivity. When food security is negatively impacted through climatic and non-climatic drivers, vulnerable households and communities respond with particular coping strategies, which can have a recursive effect on future levels of food security.

Key constructs and definitions:

<u>Household and community vulnerability</u>: In general terms, vulnerability and social resilience have been similarly defined as the ability of a system or community to resist or absorb adverse conditions.

[...]

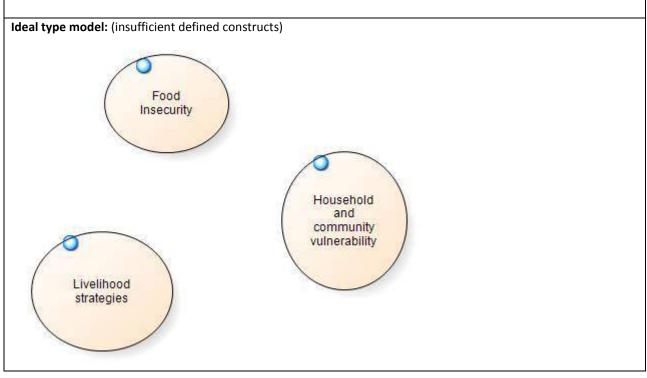
Vulnerable communities, where people are unable to buffer themselves from hazards for a number of reasons, have a low ability to cope with short-term shocks (such as drought) and to mitigate chronic stressors, which in turn means that the negative impacts on livelihoods resulting from coping and survival strategies are very high.

Misselhorn (2005)

Livelihood strategies: A livelihood maybe described as the capability, assets

and activites required for a means of living. People everywhere pursue a range of livelihood strategies in attempting to increase their income and asset base ('accumulation strategies'), spread or reduce risk (in- crease securitythrough 'adaptive strategies'), mitigate the impact of shocks ('coping strategies'), and at the extreme, ensure survival through 'survival strategies' (Devereux, 1999; Scoones, 2000). **Misselhorn (2005)** <u>Food insecurity</u>: Food insecurityin the communities described bythe

case studies maybe conceptualized as one element in an entrenched and escalating cycle of vulnerability (Fig. 3). **Misselhorn (2005)**



	ationalization of key				
Operationalization of constructs Construct operationalized: Livelihood strategies					
					Sou
Sele	ected by:	Default			
	-constructs	Intermediate			
		constructs			
		Directly	Households working	g elsewhere; agricult	ture dependent
		operationalized	household; livelihoo		
		constructs			
Cor	nceptual framework	Livelihood			
		Percent of households w	ith family member w	orking in a different	community
		Percent of households d			
		Percentage of household		the household repor	rts that they have
		attended 0 years of scho			
		Percentage of household			ir home. Orphans
		are children<18 years old		-	
		Percentage of households that report at least 1 family member who works outside of the community for their primary work activity.			
		-			ofincomo
		Percentage of households that report only agriculture as a source of income.			
Dne	erationalization of				
	-constructs				
	Households	Data collection	Household survey		
	working elsewhere	Operational questions		explanation of how	each sub-
			component was qua	antified, the survey o	question used to
			collect the data, the	e original source of t	he survey question,
			and potential sourc	es of bias.	
			[]		
				ponents and sub-co	
				elihood Vulnerability	
			Sub-components	districts of Mozam	Survey question
			Sub-components	Explanation of sub-components	Survey question
			Percent of	Percentage of	How many
			households with	households that	people in your
			family member	report at least 1	family go to a
			working in a	family member	different
			different	who works	community to
			community	outside of the	work?
			· ·	community for	
				their primary	
				work activity.	
		Sampling strategies	We pilot tested the	LVI and LVI–IPCC in	the Moma and
			Mabote		
				pique during 2007. T	
				ue as representative	
		1	inland communities	s. respectively, and t	he climate change

			issues can fronting each
			issues con- fronting each.
			[]
			Based on a sample size calculation (WHO, 2005) at the 95%
			confidence interval, 210% precision, 50% prevalence,1 and a
			design effect of 2 to account for cluster sampling, 200
			households in each
			district were surveyed.2 National 1997 census data that
			specified the total population in each village was used to
			select 20 villages in each district using the probability
			proportional to size method (WHO, 2005; UNICEF, 2008).
			[]
			1 50% prevalence refers to the point prevalence of the
			indicators selected for the LVI. This is the default value for
			sample size calculations when the prevalence of the
			indicators is unknown.
			2 Sample size formula: N = DEFF*[(Z2*p*q)/e2], where N =
			sample size, DEFF = 2; Z = 1.96 (95% Cl), p = 0.5; q = 0.5; e =
			0.10.
		Sample sizes	We pilot tested the LVI and LVI–IPCC in the Moma and
			Mabote
			Districts
			[]
			200 households in each
			district were surveyed.2 National 1997 census data that
			specified the total population in each village was used to
		Data analusia	select 20 villages in each district
		Data analysis	The LVI uses a balanced weighted average approach
			(Sullivan et al., 2002) where each sub-component contributes equally
			to the overall index even though each major component is
			comprised of a different number of sub-components.
			Becausewe intended to develop an assessment tool
			accessible to a diverse set of users in resource-poor settings,
			the LVI formula uses the simple approach of applying equal
			weights to all major components. This weighting scheme
			could be adjusted by future users as needed. Because each
			of the sub-components is measured on a different
			scale, it was first necessary to standardize each as an index.
			The equation used for this conversion was adapted from
			that used in the Human Development Index to calculate the
			life expectancy index, which is the ratio of the difference of
			the actual life expectancy and a pre-selected minimum, and
			the range of pre- determined maximum and minimum life
			expectancy (UNDP, 2007):
			$index_{sd} = (s_d - s_{min})/(s_{max} - s_{min})$
			where sd is the original sub-component for district d and
			where sd is the original sub-component for district d, and smax are the minimum and maximum values.
			smin and smax are the minimum and maximum values,
			smin and smax are the minimum and maximum values, respectively, for each sub-component determined using
119	agriculture	Data collection	smin and smax are the minimum and maximum values, respectively, for each sub-component determined using data from both districts.
119	agriculture dependent	Data collection Operational questions	smin and smax are the minimum and maximum values, respectively, for each sub-component determined using

	household		collect the data, the	-	ne survey question,
			and potential source []	es of bias.	
			[]		
			Table 1 Major com	ponents and sub-co	mponents
				elihood Vulnerability	-
			developed for two	districts of Mozamb	oique.
			Sub-components	Explanation of	Survey question
				sub-components	
			Percent of	Percentage of	Do you or
			households	households that	someone else in
			dependent solely	report only	your household
			on agriculture as a source of	agriculture as a source of	raise animals? Do you or
			income	income.	someone else in
			income	income.	your household
					grow crops? Do
					you or someone
					else in your
					household
					collect
					something from
					the bush, the forest, or lakes
					and rivers to
					sell?
		Sampling strategies	Same as previous co	onstruct	
		Sample sizes	Same as previous co	onstruct	
		Data analysis	Same as previous co		
120	livelihood	Data collection	Same as previous co		
	diversification	Operational questions	Table 1 includes and	•	
			component was qua collect the data, the		
			and potential source	•	ie sulvey question,
			[]		
				ponents and sub-co	-
				elihood Vulnerability	
			-	districts of Mozamb	
			Sub-components	Explanation of	Survey question
				sub-components	
			Average	sub-components	Do you or
			Average Agricultural	sub-components The inverse of (the number of	Do you or someone else in
			Average Agricultural Livelihood	The inverse of	-
			Agricultural	The inverse of (the number of	someone else in
			Agricultural Livelihood Diversification Index (range:	The inverse of (the number of agricultural livelihood activities +1)	someone else in your household raise animals? Do you or
			Agricultural Livelihood Diversification	The inverse of (the number of agricultural livelihood activities +1) reported by a	someone else in your household raise animals? Do you or someone else in
			Agricultural Livelihood Diversification Index (range:	The inverse of (the number of agricultural livelihood activities +1) reported by a household, e.g.,	someone else in your household raise animals? Do you or someone else in your household
			Agricultural Livelihood Diversification Index (range:	The inverse of (the number of agricultural livelihood activities +1) reported by a household, e.g., A household that	someone else in your household raise animals? Do you or someone else in your household grow crops? Do
			Agricultural Livelihood Diversification Index (range:	The inverse of (the number of agricultural livelihood activities +1) reported by a household, e.g.,	someone else in your household raise animals? Do you or someone else in your household

			resources will have a	collect something from
			Livelihood	the bush, the
			Diversification	forest, or lakes
			Index = 1/(3 + 1)	and rivers to
			= 0.25.	sell?
	Sampling strategies	Same as previous co	onstruct	
	Sample sizes	Same as previous co	onstruct	
	Data analysis	Same as previous co	onstruct	
	Data analysis			
Candidate-level	The LVI uses a balanced	weighted average app	proach (Sullivan	
Candidate-levelThe LVI uses a balanced weighted aver et al., 2002) where each sub-component is com components. Becausewe intended to a 		e intended to develop esource-poor settings, jual weights to all majo ture users as needed. It ary to standardize eac d from that used in the x, which is the ratio of elected minimum, and tancy (UNDP, 2007): – Smin) sub-component for dis	an assessment tool the LVI formula use or components. This Because each of the ch as an index. The e e Human Developme f the difference of th the range of pre- de strict d, and smin an	accessible to a s the simple s weighting scheme sub-components is quation used for this ent Index to calculate he actual life etermined maximum

Constructs with no adequate operationalizations

- Livelihood level issues (no operationalization)
- Access to sufficient food (no operationalization)
- Food insecurity (no operationalization)
- Household and community vulnerability (no operationalization)
- Direct drivers (no operationalization)

 Constructs with more than one adequate operationalizations

 Construct
 Preference rank
 Summary of operationalization

Framework summary Name of framework: IPCC **Description of framework:** This framework is guided by the definition and theory of the IPCC, which conceives of vulnerability to climate change as having three dimensions: Exposure to climate-induced shocks (a natural science phenomenon); the Sensitivity of the unit of analysis to such shocks (a social and natural science phenomenon); the adaptive capacity to deal with such shocks (a social science phenomenon). The framework often but not always creates a contextspecific index of vulnerability from indicators of these three dimensions. **Key constructs and definitions:** <u>Vulnerability (IPCC)</u>: The degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate variation to which a system is exposed, its sensitivity, and its adaptive capacity. (Fussel & Klein 2006) Exposure: The nature and degree to which a system is exposed to significant climatic variations. The exposure of a system to climate stimuli depends on the level of global cli- mate change and, due to the spatial heterogeneity of anthropogenic climate change, on the system's location (Fussel & Klein 2006) Sensitivity: The degree to which a system is affected, either adversely or beneficially, by climate-related stimuli. [...] The effect may be direct [...] or indirect [...] [...] The sensitivity of a system denotes the (generally multi-factorial and dynamic) dose – response relationship between its exposure to climatic stimuli and the re- sulting impacts. (Fussel & Klein 2006) Adaptive Capacity: The ability of a system to adjust to climate change (in- cluding climate variability and extremes) to moderate potential damages, to take advantage of opportunities, or to cope with the consequences. (Fussel & Klein 2006) Ideal type model: Vulnerability IPCC Adaptive Sensitivity Exposure Capacity Articles using framework: Antwi-Agyei et al (2013); Baca et al (2004); CARE (2009); Fussel & Klein (2006); Hahn et al (2009); Ionesco et al (2009); Jamir et al (2013); Luers et al (2013); Notenbaert et al (2013); Piya et al (2012). **Operationalization of key constructs:**

Operationalization of constructs

Construct operationalized: Vulnerability IPCC

Selected by:	expert selection [justification]	
Sub-constructs	Intermediate	
	constructs	
	Directly	
	operationalized	
	constructs	
Conceptual framework		
Operationalization of		
sub-constructs		
121 •	Data collection	
	Operational questions	
	Sampling strategies	
	Sample sizes	
	Data analysis	
122 •	Data collection	
	Operational questions	
	Sampling strategies	
	Sample sizes	
	Data analysis	
123 •	Data collection	
	Operational questions	
	Sampling strategies	
	Sample sizes	
	Data analysis	
124 •	Data collection	
	Operational questions	
	Sampling strategies	
	Sample sizes	
	Data analysis	
Candidate-level		
Analysis		

Information	Information relating to further development of framework			
Constructs w	Constructs with no adequate operationalizations			
FULLY AND A	FULLY AND ADEQUATELY OPERATIONALIZED			
Constructs with more than one adequate operationalizations				
Construct	Preference rank	Summary of operationalization		

Livelihood trajectories and resilience and vulnerability

Framework summary

Name of framework: Livelihood trajectories and resilience and vulnerability

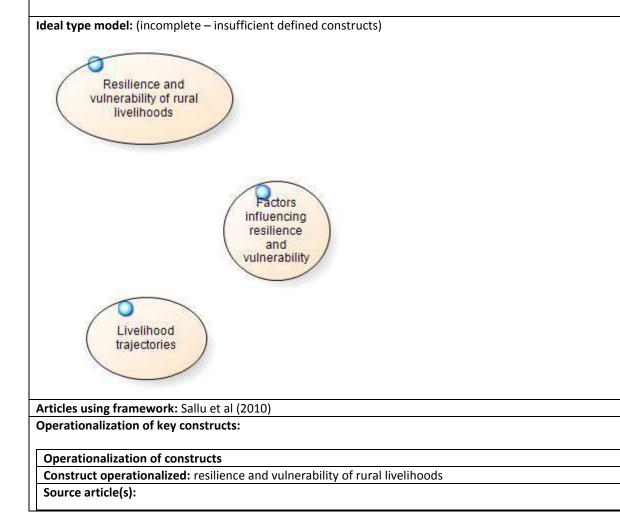
Description of framework:

On the basis of a mixed methods data collection methodology, the concept of 'livelihood trajectories' is explored among households over a period of (in this case) 30 years. With this long term approach, the framework seeks to generate narrative accounts of which livelihood strategies and trajectories lead to resilient and vulnerable states.

Key constructs and definitions:

<u>Resilience and vulnerability of rural livelihoods</u>: Fraser et al.'s (2010) vulnerability framework **Sallu et al (2010)** <u>Livelihood trajectories</u>: Bagchi et al. (1998) use the term "livelihood trajectories" to describe and explain the direction and pattern of livelihoods of individuals or groups of people (e.g., households). A livelihood trajectory approach allows the examination of an individual household's "strategic behavior that is embedded in a historical repertoire, in social differentiation" (de Haan and Zoomers 2005), and in perceptions of risk. Such an approach is sensitive to life histories (an individual's own "story" of their changing livelihoods). **Sallu et al (2010)** <u>Dynamic natural resource base</u>: NO DEFINITION

<u>Factors influencing resilience and vulnerability</u>: Through comparative research we provide a rich contextual narrative and use it to explore those factors that in isolation and combination push livelihoods along particular "trajectories" towards vulnerability or resilience. **Sallu et al (2010)**



Selected by:		default	
Sub	-constructs	Intermediate	
		constructs	
		Directly	dynamic natural resource base; factors influencing
		operationalized	resilience and vulnerability; livelihood trajectories
		constructs	
Conceptual framework			
Оре	erationalization of		
sub	-constructs		
125 dynamic natural resource base		Data collection	Repeated vegetation and wild animal surveys were conducted before and after rains, and time-series sets of Landsat images and wild animal aerial count data records were collected from the Department of Surveys and Mapping and the Department of Wildlife and National Parks. Soil and climate data were collected from the Department of Surveys and Mapping and the Department of Meteorological Services, respectively (see Sallu [2007] for a more detailed outline of the methodology and data). Environmental change data were then analyzed in conjunction with livelihood
			trajectory results in order to elucidate the key dynamics of relationships between livelihoods and the natural resource base.
		Operational questions	2ndary data
		Sampling strategies	2ndary data
		Sample sizes	2ndary data
		Data analysis	Quantitative data sets were analyzed using multivariate statistics. Livelihood and environmental data were classified using cluster analysis, and correlations were tested using principal components analysis. Landsat images were classified using ERDAS Imagine V.9 software and landscape-level changes were detected from raster attribute comparison (see Sallu [2007] for a more detailed outline of data analysis procedures).
126	factors influencing	Data collection	Not Transparent
	resilience and	Operational questions	
	vulnerability	Sampling strategies	
	,	Sample sizes	
		Data analysis	
127	livelihood	Data collection	Not Transparent
12/			Not Transparent
	trajectories	Operational questions	
		Sampling strategies	
		Sample sizes	
6		Data analysis	
	didate-level		cted throughout the period of information gathering. Initially,
Ana	alysis	data, but it progressed to	level in order to note any trends in the o a more detailed level as both qualitative and quantitative
		coded through processes	Il information was drawn together. Qualitative data were s of indexing the data under emerging themes. This tion of the factors that played an important role in the

construction of livelihood strategies. Consistent triangulation of the results highlighted any contradictions and similarities in the different data sources. Where contradictions were found, further iterative reflection took place in the form of focus groups in order to ascertain why and how the conflicts in information may have occurred. This became a circular process that led to inductive interpretation and
explanation as the ecological information was gradually juxtaposed within the emergent socioeconomic context. Quantitative data sets were analyzed using multivariate statistics. Livelihood and environmental data were classified using cluster analysis, and correlations were tested using principal components analysis. Landsat images were classified using ERDAS Imagine V.9 software and landscape-level changes were detected from raster attribute comparison (see Sallu [2007] for a more detailed outline of data analysis procedures). Based on this analysis, we aimed to identify contemporary strategies and the nature of trajectories to which they led. In doing this, we also identified the key changes to the vulnerability context and the combination of factors that have led to more resilient or vulnerable livelihood outcomes.

Constructs with no adequate operationalizations

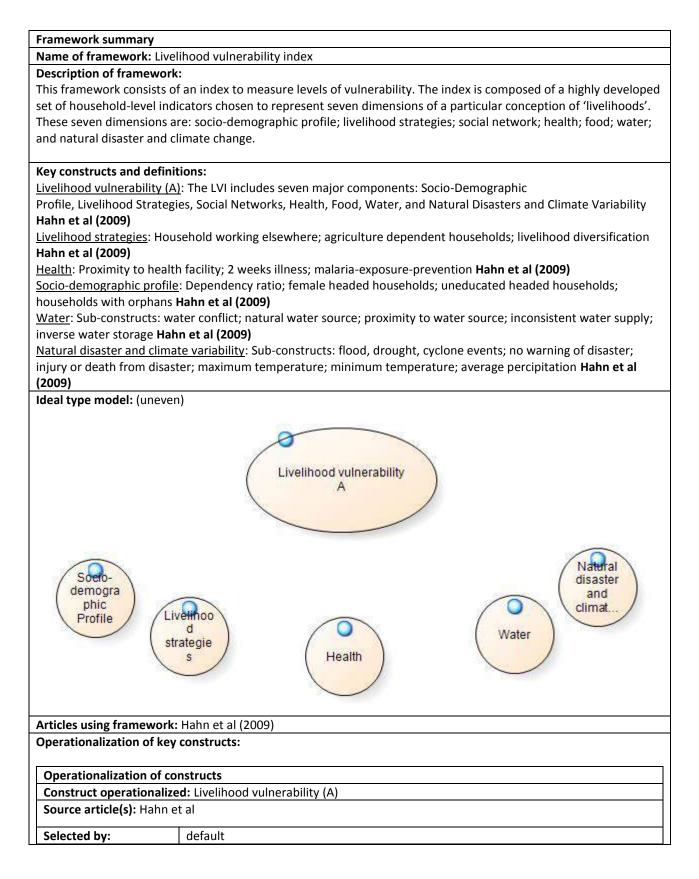
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- factors influencing resilience and vulnerability (no transparent operationalization)
- livelihood trajectories (no transparent operationalization)

Constructs with more than one adequate operationalizations

Construct Preference rank Summary of operationalization

Livelihood vulnerability index



Sub-constructs	Intermediate	Socio-demographic profile; livelihood strategies; social		
	constructs	networks; health; food; water; natural disaster and climate		
		change		
	Directly	Dependency ratio; percent of female headed households;		
	operationalized	households with orphans; uneducated headed households;		
	constructs	Households working elsewhere; agriculture dependent		
		household; livelihood diversification; Receive-give ration;		
		borrow-lend ration; independent of local government;		
		Family with chronic illness; proximity to health facility; 2		
		weeks illness; malaria exposure-prevention; Food from		
		family farm; struggle for food; crop diversity; dont save		
		crops; dont save seeds; Water conflict; natural water source;		
		proximity to water source; inconsistent water supply;		
		inverse water stored; Flood, drought, cyclone events; injury		
		or death from disaster; no warning of disaster; maximum		
		temperature; minimum temperature; average precipitation		
Conceptual framework	The IV/Lincludes cover			
		major components: Socio-Demographic egies, Social Networks, Health, Food, Water, and Natural		
	Disasters and Climate V	-		
		anability.		
	[]	file		
	Socio-demographic pro			
	Explanation of sub-com			
		under 15 and over 65 years of age to the population between		
	19 and 64 years of age.			
	Percent of female-headed households			
	Percent of households where head of household has not attended school			
	Percent of households with orphans			
	Livelihood			
		with family member working in a different community		
		dependent solely on agriculture as a source of income		
	-	ds where the head of the household reports that they have		
	attended 0 years of sch			
	-	ds that have at least 1 orphan living in their home. Orphans		
		ld who have lost one or both parents.		
	-	lds that report at least 1 family member who works outside of		
	the community for their			
		ds that report only agriculture as a source of income.		
	[]			
	Social Networks			
	Average Receive: Give ra			
		Noney ratio (range: 0.5–2)		
	[]			
	Health			
	Average time to health			
		with family member with chronic illness		
		where a family member had to miss work or school in the last 2		
	weeks due to illness			
		ure*Prevention Index (range: 0–12)		
	[]			
	Food			
		dependent on family farm for food		
	Average number of more	nths households struggle to find food (range: 0–12)		

	[] Water Percent of households r Percent of households t Average time to water s Percent of households t Inverse of the average n [] Natural disasters and cli Average number of floo Percent of households t disasters Percent of households v disaster in the past 6 yea Mean standard deviatio Mean standard deviatio	hat utilize a natural w ource (minutes) hat do not have a cor number of liters of wa mate variability d, drought, and cyclo hat did not receive a vith an injury or death ars n of the daily average n of the daily average	vater source isistent water supply ter stored per house ne events in the pas warning about the p h as a result of the m e maximum tempera e minimum tempera	ehold (range: >0–1) t 6 years (range: 0–7) ending natural nost severe natural ture by month	
Operationalization of sub-constructs					
128 Dependency ratio	Data collection	household surveys			
	Operational questions	-			
		Sub-components	Explanation of sub-components	Survey question	
		Dependency ratio	Ratio of the population under 15 and over 65 years of age to the population between 19 and 64 years of age.	Could you please list the ages and sexes of every person who eats and sleeps in this house? If you had a visitor who ate and slept here for the last 3 days, please include them as well.	
	Sampling strategies	We pilot tested the LVI and LVI–IPCC in the Moma and Mabote Districts of Mozambique during 2007. These were selected by CARE-Mozambique as representative of coastal and inland communities, respectively, and the climate change issues con- fronting each. [] Based on a sample size calculation (WHO, 2005) at the 95%			

r 			
			confidence interval, 210% precision, 50% prevalence,1 and a design effect of 2 to account for cluster sampling, 200 households in each
			district were surveyed.2 National 1997 census data that
			specified the total population in each village was used to
			select 20 villages in each district using the probability
			proportional to size method (WHO, 2005; UNICEF, 2008). []
			1 50% prevalence refers to the point prevalence of the
			indicators selected for the LVI. This is the default value for
			sample size calculations when the prevalence of the
			indicators is unknown.
			2 Sample size formula: N = DEFF*[(Z2*p*q)/e2], where N =
			sample size, DEFF = 2; Z = 1.96 (95% Cl), p = 0.5; q = 0.5; e =
			0.10.
		Sample sizes	We pilot tested the LVI and LVI–IPCC in the Moma and
			Mabote
			Districts
			[]
			200 households in each
			district were surveyed.2 National 1997 census data that
			specified the total population in each village was used to
			select 20 villages in each district
		Data analysis	The LVI uses a balanced weighted average approach
			(Sullivan
			et al., 2002) where each sub-component contributes equally
			to the overall index even though each major component is
			comprised of a different number of sub-components.
			Becausewe intended to develop an assessment tool
			accessible to a diverse set of users in resource-poor settings,
			the LVI formula uses the simple approach of applying equal
			weights to all major components. This weighting scheme
			could be adjusted by future users as needed. Because each
			of the sub-components is measured on a different
			scale, it was first necessary to standardize each as an index.
			The equation used for this conversion was adapted from
			that used in the Human Development Index to calculate the
			life expectancy index, which is the ratio of the difference of
			the actual life expectancy and a pre-selected minimum, and
			the range of pre- determined maximum and minimum life
			expectancy (UNDP, 2007):
			index _{sd} = (s _d - s _{min})/(s _{max} - s _{min})
			where sd is the original sub-component for district d, and
			smin and smax are the minimum and maximum values,
			respectively, for each sub-component determined using data
			from both districts.
129	percent of female	Data collection	Same as previous construct
	headed	Operational questions	Table 1 includes an explanation of how each sub-component
	households		was quantified, the survey question used to collect the data,
			the original source of the survey question, and potential
l I			sources of bias.
		1	[]

			Table 1 Major com	nonents and sub-co	mnonents		
			Table 1 Major components and sub-componentscomprising the Livelihood Vulnerability Index (LVI)				
				districts of Mozamk			
			Sub-components	Explanation of	Survey question		
				sub-components	ourrey question		
			Percent of	Percentage of	Are you the head		
			female-headed	households	of the		
			households	where the	household?		
				primary adult is			
				female. If a male			
				head is away			
				from the home			
				>6 months per			
				year the female			
				is counted as the			
				head of the			
			household.				
		Sampling strategies	Same as previous co				
		Sample sizes	Same as previous co				
		Data analysis	Same as previous co				
130	households with	Data collection	Same as previous co				
	orphans	Operational questions	Table 1 includes an explanation of how each sub-component				
				was quantified, the survey question used to collect the data, the original source of the survey question, and potential			
			the original source of				
			the original source of sources of bias.				
			the original source of				
			the original source of sources of bias.	of the survey questic	on, and potential		
			the original source of sources of bias. [] Table 1 Major com	of the survey question	on, and potential		
			the original source of sources of bias. [] Table 1 Major com comprising the Liv	of the survey questic	on, and potential mponents y Index (LVI)		
			the original source of sources of bias. [] Table 1 Major com comprising the Liv	of the survey question ponents and sub-co elihood Vulnerability	on, and potential mponents y Index (LVI)		
			the original source of sources of bias. [] Table 1 Major com comprising the Liv developed for two	of the survey question ponents and sub-co elihood Vulnerability districts of Mozamb	on, and potential mponents y Index (LVI) pique.		
			the original source of sources of bias. [] Table 1 Major com comprising the Liv developed for two	of the survey question ponents and sub-co elihood Vulnerability districts of Mozamb <i>Explanation of</i>	on, and potential mponents y Index (LVI) pique.		
			the original source of sources of bias. [] Table 1 Major com comprising the Liv developed for two Sub-components	of the survey question ponents and sub-co elihood Vulnerability districts of Mozama <i>Explanation of</i> <i>sub-components</i>	on, and potential omponents y Index (LVI) oique. Survey question		
			the original source of sources of bias. [] Table 1 Major com comprising the Liv developed for two Sub-components Percent of	of the survey question ponents and sub-co- elihood Vulnerability districts of Mozamb <i>Explanation of</i> <i>sub-components</i> Percentage of	on, and potential mponents y Index (LVI) Dique. Survey question Are there any		
			the original source of sources of bias. [] Table 1 Major com comprising the Liv developed for two Sub-components Percent of households with	of the survey question ponents and sub-co- elihood Vulnerability districts of Mozama <i>Explanation of</i> <i>sub-components</i> Percentage of households that have at least 1 orphan living in	on, and potential mponents y Index (LVI) bique. Survey question Are there any children less than 18 years old from other		
			the original source of sources of bias. [] Table 1 Major com comprising the Liv developed for two Sub-components Percent of households with	of the survey question ponents and sub-co- elihood Vulnerability districts of Mozama <i>Explanation of</i> <i>sub-components</i> Percentage of households that have at least 1 orphan living in their home.	on, and potential mponents y Index (LVI) Dique. Survey question Are there any children less than 18 years old from other families living in		
			the original source of sources of bias. [] Table 1 Major com comprising the Liv developed for two Sub-components Percent of households with	of the survey question ponents and sub-co- elihood Vulnerability districts of Mozama <i>Explanation of</i> <i>sub-components</i> Percentage of households that have at least 1 orphan living in their home. Orphans are	on, and potential mponents y Index (LVI) bique. Survey question Are there any children less than 18 years old from other families living in your house		
			the original source of sources of bias. [] Table 1 Major com comprising the Liv developed for two Sub-components Percent of households with	ponents and sub-co elihood Vulnerability districts of Mozamb <i>Explanation of</i> <i>sub-components</i> Percentage of households that have at least 1 orphan living in their home. Orphans are children<18	on, and potential omponents y Index (LVI) bique. Survey question Are there any children less than 18 years old from other families living in your house because one or		
			the original source of sources of bias. [] Table 1 Major com comprising the Liv developed for two Sub-components Percent of households with	of the survey question ponents and sub-co- elihood Vulnerability districts of Mozamb <i>Explanation of</i> <i>sub-components</i> Percentage of households that have at least 1 orphan living in their home. Orphans are children<18 years old who	on, and potential mponents y Index (LVI) bique. Survey question Are there any children less than 18 years old from other families living in your house because one or both of their		
			the original source of sources of bias. [] Table 1 Major com comprising the Liv developed for two Sub-components Percent of households with	of the survey question ponents and sub-co- elihood Vulnerability districts of Mozama <i>Explanation of</i> <i>sub-components</i> Percentage of households that have at least 1 orphan living in their home. Orphans are children<18 years old who have lost one or	on, and potential mponents y Index (LVI) bique. Survey question Are there any children less than 18 years old from other families living in your house because one or both of their parents has		
		Compling strategies	the original source of sources of bias. [] Table 1 Major com comprising the Liv developed for two Sub-components Percent of households with orphans	of the survey question ponents and sub-co- elihood Vulnerability districts of Mozama <i>Explanation of</i> <i>sub-components</i> Percentage of households that have at least 1 orphan living in their home. Orphans are children<18 years old who have lost one or both parents.	on, and potential mponents y Index (LVI) bique. Survey question Are there any children less than 18 years old from other families living in your house because one or both of their		
		Sampling strategies	the original source of sources of bias. [] Table 1 Major com comprising the Liv developed for two Sub-components Percent of households with orphans Same as previous co	of the survey question ponents and sub-co- elihood Vulnerability districts of Mozamb <i>Explanation of</i> <i>sub-components</i> Percentage of households that have at least 1 orphan living in their home. Orphans are children<18 years old who have lost one or both parents.	on, and potential mponents y Index (LVI) bique. Survey question Are there any children less than 18 years old from other families living in your house because one or both of their parents has		
		Sample sizes	the original source of sources of bias. [] Table 1 Major com comprising the Liv developed for two <i>Sub-components</i> Percent of households with orphans Same as previous co Same as previous co	of the survey question ponents and sub-co- elihood Vulnerability districts of Mozamb <i>Explanation of</i> <i>sub-components</i> Percentage of households that have at least 1 orphan living in their home. Orphans are children<18 years old who have lost one or both parents.	on, and potential mponents y Index (LVI) bique. Survey question Are there any children less than 18 years old from other families living in your house because one or both of their parents has		
12	upoducated	Sample sizes Data analysis	the original source of sources of bias. [] Table 1 Major com comprising the Liv developed for two <i>Sub-components</i> Percent of households with orphans Same as previous co Same as previous co Same as previous co	of the survey question ponents and sub-co- elihood Vulnerability districts of Mozamb <i>Explanation of</i> <i>sub-components</i> Percentage of households that have at least 1 orphan living in their home. Orphans are children<18 years old who have lost one or both parents. Distruct	on, and potential mponents y Index (LVI) bique. Survey question Are there any children less than 18 years old from other families living in your house because one or both of their parents has		
13:		Sample sizes Data analysis Data collection	the original source of sources of bias. [] Table 1 Major com comprising the Liv developed for two <i>Sub-components</i> Percent of households with orphans Same as previous co Same as previous co	of the survey question ponents and sub-co- elihood Vulnerability districts of Mozamb <i>Explanation of</i> <i>sub-components</i> Percentage of households that have at least 1 orphan living in their home. Orphans are children<18 years old who have lost one or both parents. Distruct	on, and potential mponents y Index (LVI) bique. Survey question Are there any children less than 18 years old from other families living in your house because one or both of their parents has		
13:	headed	Sample sizes Data analysis Data collection Operational questions	the original source of sources of bias. [] Table 1 Major com comprising the Liv developed for two <i>Sub-components</i> Percent of households with orphans Same as previous co Same as previous co Same as previous co	of the survey question ponents and sub-co- elihood Vulnerability districts of Mozamb <i>Explanation of</i> <i>sub-components</i> Percentage of households that have at least 1 orphan living in their home. Orphans are children<18 years old who have lost one or both parents. Distruct	on, and potential mponents y Index (LVI) bique. Survey question Are there any children less than 18 years old from other families living in your house because one or both of their parents has		
13:		Sample sizes Data analysis Data collection Operational questions Sampling strategies	the original source of sources of bias. [] Table 1 Major com comprising the Liv developed for two <i>Sub-components</i> Percent of households with orphans Same as previous co Same as previous co Same as previous co	of the survey question ponents and sub-co- elihood Vulnerability districts of Mozamb <i>Explanation of</i> <i>sub-components</i> Percentage of households that have at least 1 orphan living in their home. Orphans are children<18 years old who have lost one or both parents. Distruct	on, and potential mponents y Index (LVI) bique. Survey question Are there any children less than 18 years old from other families living in your house because one or both of their parents has		
13:	headed	Sample sizes Data analysis Data collection Operational questions	the original source of sources of bias. [] Table 1 Major com comprising the Liv developed for two <i>Sub-components</i> Percent of households with orphans Same as previous co Same as previous co Same as previous co	of the survey question ponents and sub-co- elihood Vulnerability districts of Mozamb <i>Explanation of</i> <i>sub-components</i> Percentage of households that have at least 1 orphan living in their home. Orphans are children<18 years old who have lost one or both parents. Distruct	on, and potential mponents y Index (LVI) bique. Survey question Are there any children less than 18 years old from other families living in your house because one or both of their parents has		

		Ou anatianal ii	Table 4 in 1		
	working elsewhere	Operational questions		survey question use	each sub-component d to collect the data, on, and potential
			Table 1 Major com	ponents and sub-co	mponents
			comprising the Live	elihood Vulnerability	y Index (LVI)
			developed for two	districts of Mozamb	pique.
			Sub-components	Explanation of sub-components	Survey question
			Percent of households with family member working in a different community	Percentage of households that report at least 1 family member who works outside of the community for their primary work activity.	How many people in your family go to a different community to work?
		Sampling strategies	Same as for 'depend		
		Sample sizes	Same as for 'depend		
		Data analysis	Same as for 'depend	•	
13	agriculture	Data collection	Same as previous co		
	dependent	Operational questions			each sub-component
	household		Table 1 includes an explanation of how each sub-component was quantified, the survey question used to collect the data,		
			the original source of		
			sources of bias.		
			[]		
			Table 1 Major com	ponents and sub-co	mponents
			-	elihood Vulnerability	-
			developed for two	districts of Mozamb	pique.
			Sub-components	Explanation of sub-components	Survey question
			Percent of households dependent solely on agriculture as a source of income	Percentage of households that report only agriculture as a source of income.	Do you or someone else in your household raise animals? Do you or someone else in your household grow crops? Do you or someone else in your household collect something from the bush, the forest, or lakes and rivers to sell?

		Compling strategies	Samo as provious s	anctruct	
		Sampling strategies	Same as previous co		
		Sample sizes	Same as previous co		
		Data analysis	Same as previous co		
134		Data collection	Same as previous co		
	diversification	Operational questions	Table 1 includes an explanation of how each sub-component was quantified, the survey question used to collect the data, the original source of the survey question, and potential sources of bias. []		
			comprising the Liv	ponents and sub-co elihood Vulnerability	y Index (LVI)
				districts of Mozamb	-
			Sub-components	Explanation of sub-components	Survey question
			Average Agricultural Livelihood Diversification Index (range: 0.20–1)a	The inverse of (the number of agricultural livelihood activities +1) reported by a household, e.g., A household that farms, raises animals, and collects natural resources will have a Livelihood Diversification Index = 1/(3 + 1) = 0.25.	Do you or someone else in your household raise animals? Do you or someone else in your household grow crops? Do you or someone else in your household collect something from the bush, the forest, or lakes and rivers to sell?
		Sampling strategies	Same as previous co	onstruct	· · · · ·
		Sample sizes	Same as previous co		
		Data analysis	Same as previous co		
135	Receive-give ratio	Data collection	-		
		Operational questions	Same as previous construct Is Table 1 includes an explanation of how each sub-comp was quantified, the survey question used to collect the the original source of the survey question, and potenti sources of bias. []		
		Table 1 Major components and sub-compo comprising the Livelihood Vulnerability Ind developed for two districts of Mozambique Sub-componentsSub-componentsExplanation of sub-components		y Index (LVI)	
			Average	Ratio of (the	In the past
			Receive:Give	number of types	month, did
			ratio (range: 0–	of help received	relatives or
			15)	by a household	friends help you
1			-,	in the past	and your family:

		Sampling strategies Sample sizes	Same as previous co Same as previous co	onstruct	(e.g., Get medical care or medicines, Sell animal products or other goods produced by family, Take care of children) In the past month, did you and your family help relatives or friends: (same choices as above)	
	1 1 1	Data analysis	Same as previous co			
136	borrow-lend ratio	Data collection Operational questions	Same as previous construct Table 1 includes an explanation of how each sub-com was quantified, the survey question used to collect th the original source of the survey question, and potent sources of bias. []			
			comprising the Liv	ponents and sub-co elihood Vulnerability districts of Mozamb	/ Index (LVI)	
			Sub-components	Explanation of sub-components	Survey question	
			Average	Ratio of a	Did you borrow	
			Borrow:Lend	household	any money from	
			Money ratio $(range: 0.5-2)$	borrowing	relatives or friends in the	
			(range: 0.5–2)	money in the past month to a household lending money in the past month, e.g., If a household borrowed money but did not lend money, the ratio = 2:1 or 2 and if they lent money but did not borrow any, the ratio = 1:2 or 0.5.	friends in the past month? Did you lend any money to relatives or friends in the past month?	
		Sampling strategies	Same as previous co			
		Sample sizes	Same as previous co			
		Data analysis	Same as previous co	onstruct		

137	independent of	Data collection	Same as previous construct			
_]	local government	Operational questions			each sub-component	
			was quantified, the survey question used to collect the data,			
			the original source of the survey question, and potential			
			sources of bias.	in, and potential		
			[]			
			[···]			
			Table 1 Major com	ponents and sub-co	mponents	
			-	elihood Vulnerability		
				districts of Mozamb		
			Sub-components	Explanation of	Survey question	
				sub-components		
			Percent of	Percentage of	In the past 12	
			households that	households that	months, have	
			have not gone to	reported that	you or someone	
			their local	they have not	in your family	
			government for	asked their local	gone to your	
			assistance in the	government for	community	
			past 12 months	any assistance in	leader for help?	
				the past 12		
				months.		
		Sampling strategies	Same as previous co	onstruct		
		Sample sizes	Same as previous co			
		Data analysis	Same as previous co			
138	Family with	Data collection	Same as previous co			
	chronic illness	Operational questions	Table 1 includes an explanation of how each sub-component was quantified, the survey question used to collect the data,			
			the original source of	of the survey questic	on, and potential	
			sources of bias.			
			[]			
			Table 1 Maior com	ponents and sub-co	mponents	
			-	elihood Vulnerability		
				districts of Mozamb		
			Sub-components	Explanation of	Survey question	
			,	sub-components		
			Percent of	Percentage of	Is anybody in	
			households with	households that	your family	
			family member	report at least 1	chronically ill	
			i uning incluser		· · · · · · · · · · · · · · · · · · ·	
			with chronic	family member	(they get sick	
			-	family member with chronic	(they get sick very often)?	
			with chronic		(they get sick very often)?	
			with chronic	with chronic		
			with chronic	with chronic illness. Chronic		
			with chronic	with chronic illness. Chronic illness was defined		
			with chronic	with chronic illness. Chronic illness was defined subjectively by		
		Sampling strategies	with chronic illness	with chronic illness. Chronic illness was defined subjectively by respondent.		
		Sampling strategies Sample sizes	with chronic illness Same as previous co	with chronic illness. Chronic illness was defined subjectively by respondent. onstruct		
		Sampling strategies Sample sizes Data analysis	with chronic illness	with chronic illness. Chronic illness was defined subjectively by respondent. onstruct		
139	proximity to health	Sample sizes	with chronic illness Same as previous co Same as previous co	with chronic illness. Chronic illness was defined subjectively by respondent. onstruct onstruct		
139	proximity to health facility	Sample sizes Data analysis	with chronic illness Same as previous co Same as previous co Same as previous co Same as previous co	with chronic illness. Chronic illness was defined subjectively by respondent. onstruct onstruct onstruct onstruct		

			comprising the Live	of the survey question ponents and sub-co- elihood Vulnerability districts of Mozamk <i>Explanation of</i> <i>sub-components</i> Average time it takes the households to	mponents y Index (LVI)
				get to the nearest health facility.	facility?
		Sampling strategies	Same as previous co	nstruct	
		Sample sizes	Same as previous co		
		Data analysis	Same as previous co		
140	2 weeks illness	Data collection	Same as previous co	onstruct	
		Operational questions	Table 1 includes an explanation of how each sub-component was quantified, the survey question used to collect the data, the original source of the survey question, and potential sources of bias. []		
			comprising the Live developed for two	ponents and sub-co elihood Vulnerability districts of Mozamk	y Index (LVI) pique.
			Sub-components	Explanation of sub-components	Survey question
			Percent of households	Percentage of households that	Has anyone in your family been
			where a family	report at least 1	so sick in the
			member had to	family member	past 2 weeks
			miss work or	who had to miss	that they had to
			school in the last	school of work	miss work or
			2 weeks due to	due to illness in	school?
			illness	the last 2 weeks.	
		Sampling strategies	Same as previous co		
		Sample sizes	Same as previous co		
		Data analysis	Same as previous co		
141	malaria exposure-	Data collection	Same as previous co		
	prevention	Operational questions	Table 1 includes an explanation of how each sub-componer was quantified, the survey question used to collect the data the original source of the survey question, and potential sources of bias. []		
			Table 1 Major components and sub-components comprising the Livelihood Vulnerability Index (LVI) developed for two districts of Mozambique.Sub-componentsExplanation ofSurvey		

				sub-componen	ts question		
			Average Malaria	Months	Which months		
			Exposure*Preventio		of the year is		
			Index (range: 0–12)	exposure to	malaria		
				malaria*Ownin			
				at least one	bad? How		
				bednet indicate			
				(have bednet =			
				0.5, no bednet			
				1) (e.g.,			
				Respondent			
				reported malar	ia		
				is a problem	la		
				-			
				January–March			
				and they do no own a bednet =			
					-		
				3*1 = 3).			
		Sampling strategies	Same as previous con				
		Sample sizes	Same as previous con				
		Data analysis	Same as previous con				
142	Food from family	Data collection	Same as previous con				
	farm	Operational questions	Table 1 includes an ex		-		
			was quantified, the survey question used to collect the data,				
			the original source of the survey question, and potential				
			sources of bias.				
			[]				
			Table 1 Major comp				
			comprising the Livel				
			developed for two d				
				Explanation of	Survey question		
				sub-components			
				Percentage of	Where does your		
				households that	family get most		
				get their food	of its food?		
				primarily from			
				their personal			
				farms.			
		Sampling strategies	Same as previous con				
		Sample sizes	Same as previous con				
		Data analysis	Same as previous con				
143	struggle for food	Data collection	Same as previous con				
		Operational questions	Table 1 includes an ex		-		
			was quantified, the su	· ·			
			the original source of	tne survey questio	n, and potential		
			sources of bias.				
			[]				
			Table 1 Major comp				
			comprising the Livel				
			developed for two d				
1			Sub-components	Explanation of	Survey question		

		[
				sub-components	
			Average number	Average number	Does your family
			of months	of months	have adequate
			households	households	food the whole
			struggle to find	struggle to	year, or are there
			food (range: 0–	obtain food for	times during the
			12)	their family.	year that your
					family does not
					have enough
					food?
					Howmanymonths a year does your
					family have
					trouble getting
					enough food?
		Sampling strategies	Same as previous co	onstruct	chough loou.
		Sample sizes	Same as previous co		
		Data analysis	Same as previous co		
144	crop diversity	Data collection	Same as previous co	onstruct	
		Operational questions		•	each sub-component
			was quantified, the	survey question use	d to collect the data,
			the original source of	of the survey questic	on, and potential
			sources of bias.		
			[]		
			-	ponents and sub-co	
				elihood Vulnerability	
				districts of Mozamb	-
			Sub-components	Explanation of	Survey question
			Average Cren	<i>sub-components</i> The inverse of	What kind of
			Average Crop Diversity Index	(the number of	crops does your
			(range: >0–1)a	crops grown by a	household grow?
				household +1).	nousenoid grow:
				e.g., A household	
				that grows	
				pumpkin, maize,	
				nhemba beans,	
				and cassava will	
				have a Crop	
		Sampling strategies	Same as previous co	Diversity	
		Sample sizes	Same as previous co		
		Data analysis	Same as previous co		
145	dont save crops	Data collection	Same as previous co		
	•	Operational questions	•		each sub-component
			was quantified, the	survey question use	d to collect the data,
			the original source of	of the survey questic	on, and potential
			sources of bias.		
			[]		
			Table 4 Mart		
		1	LL Table 1 Major com	ponents and sub-co	mponents

	Τ					
			comprising the Livelihood Vulnerability Index (LVI)			
			-	districts of Mozamb		
			Sub-components	Explanation of	Survey question	
				sub-components		
			Percent of	Percentage of	Does your family	
			households that	households that	save some of the	
			do not save	do not save	crops you	
			crops	crops from each	harvest to eat	
				harvest.	during a	
					different time of	
					year?	
		Sampling strategies	Same as previous co	onstruct		
		Sample sizes	Same as previous co	onstruct		
		Data analysis	Same as previous co	onstruct		
14	dont save seeds	Data collection	Same as previous co	onstruct		
		Operational questions	Table 1 includes an	explanation of how	each sub-component	
			was quantified, the	survey question use	d to collect the data,	
			the original source of	of the survey questic	on, and potential	
			sources of bias.			
			[]			
			Table 1 Major com	ponents and sub-co	omponents	
			comprising the Liv	elihood Vulnerability	y Index (LVI)	
				districts of Mozambique.		
			Sub-components	Explanation of	Survey question	
				sub-components		
			Percent of	Percentage of	Does your family	
			households that	households that	save seeds to	
			do not save	do not have	grow the next	
			seeds	seeds from year	year?	
				to year.		
		Sampling strategies	Same as previous co	onstruct		
		Sample sizes	Same as previous co	onstruct		
		Data analysis	Same as previous co			
14	Water conflict	Data collection	Same as previous co			
		Operational questions			each sub-component	
					d to collect the data,	
			the original source of the survey question, and potential			
			sources of bias.	-		
			[]			
			Table 1 Major com	ponents and sub-co	omponents	
			comprising the Liv	elihood Vulnerability	y Index (LVI)	
			developed for two	districts of Mozamb	pique.	
			Sub-components	Explanation of	Survey question	
				sub-components		
			Percent of	Percentage of	In the past year,	
			households	households that	have you heard	
			reporting water	report having	about any	
			conflicts	heard about	conflicts over	
				conflicts over	water in your	
	1	1	11	water in their	community?	

				community		
		Sampling strategies	Same as previous co	community.		
		Sample sizes	Same as previous co			
		Data analysis				
		Sampling strategies	Same as previous construct			
			Same as previous construct			
		Sample sizes	Same as previous co			
1.40		Data analysis Data collection	Same as previous co			
148	natara nato.		Same as previous co		anch sub component	
	source	Operational questions	Table 1 includes an explanation of how each sub-compone was quantified, the survey question used to collect the da the original source of the survey question, and potential sources of bias. []			
comprising the Live				ponents and sub-co elihood Vulnerability districts of Mozamb	y Index (LVI)	
			Sub-components	Explanation of sub-components	Survey question	
			Percent of households that	Percentage of households that	Where do you collect your	
			utilize a natural	report a creek,	water from?	
			water source	river, lake, pool,		
				or hole as their		
				primary water		
				source.		
		Sampling strategies	Same as previous co			
		Sample sizes	Same as previous co			
		Data analysis	Same as previous co			
149	p,	Data collection	Same as previous co			
	source	Operational questions		•	each sub-component	
					d to collect the data,	
			the original source of hiss	of the survey questic	on, and potential	
			sources of bias. []			
			[]			
			Table 1 Major com	ponents and sub-co	mnonents	
				elihood Vulnerability		
				districts of Mozam		
			Sub-components	Explanation of	Survey question	
				sub-components	carrey question	
			Average time to	Average time it	How long does it	
			water source	takes the	take to get to	
			(minutes)	households to	your water	
				travel to their	source?	
				primary water		
				source.		
		Sampling strategies	Same as previous co			
		Sample sizes	Same as previous co			
		Data analysis	Same as previous co			
150	inconsistent water	Data collection	Same as previous co			
-50	meensistent water					

	1		T 11 63 1 3	1		
	supply	Operational questions			each sub-component	
				· ·	d to collect the data,	
			the original source of sources of bias.	of the survey questic	on, and potential	
			[]			
			Table 1 Major com	ponents and sub-co	mnonents	
			-	elihood Vulnerability	-	
				districts of Mozam		
			Sub-components	Explanation of	Survey question	
				sub-components	Survey question	
			Percent of	Percentage of	Is this water	
			households that	households that	available	
			do not have a	report that	everyday?	
			consistent water	water is not		
			supply	available at their		
				primary water		
				source everyday		
		Sampling strategies	Same as previous co	onstruct		
		Sample sizes	Same as previous co			
		Data analysis	Same as previous co	onstruct		
151	inverse water	Data collection	Same as previous co	onstruct		
	stored	Operational questions	Table 1 includes an explanation of how each sub-component			
			was quantified, the survey question used to collect the da			
			the original source of the survey question, and potential			
			sources of bias.			
			[]			
			Table 1 Major com	ponents and sub-co	mononts	
				-		
			comprising the Livelihood Vulnerability Index (LVI) developed for two districts of Mozambique.			
			Sub-components	Explanation of	Survey question	
				sub-components	Survey question	
			Inverse of the	The inverse of	What containers	
			average number	(the average	do you usually	
			of liters of water		store water in?	
			stored per	of water stored	How many? How	
			household	by each	many liters are	
			(range: >0–1)	household + 1).	they?	
		Sampling strategies	Same as previous construct			
		Sample sizes	Same as previous co	onstruct		
		Data analysis	Same as previous construct			
152	, ,	Data collection	Same as previous co			
	cyclone events	Operational questions	Table 1 includes an explanation of how each sub-component			
			was quantified, the survey question used to collect the data,			
			the original source of	of the survey question	on, and potential	
			sources of bias.			
			[]			
			Table 1 Mairy -	nononte erell-	mananata	
			Table 1 Major components and sub-components			
				comprising the Livelihood Vulnerability Index (LVI) developed for two districts of Mozambique.		
			l developed for two	districts of Mozami	nque.	

		1		I	1 - 11
			Sub-	Explanation of	Survey question
			components	sub-	
				components	
			Average	Total number	How many times has
			number of	of floods,	this area been
			flood, drought,	droughts, and	affected by a
			and cyclone	cyclones that	flood/cyclone/drought
			events in the	were reported	in 2001–2007?
			past 6 years	by households	
			(range: 0–7)	in the past 6	
				years.	
		Sampling strategies	Same as previous		
		Sample sizes	Same as previous		
		Data analysis	Same as previous		
153	, ,	Data collection	Same as previous		
	from disaster	Operational questions		•	now each sub-component
			•		n used to collect the data,
			-	e of the survey qu	estion, and potential
			sources of bias.		
			[]		
			Table 1 Major co	omponents and su	ib-components
			comprising the I	ivelihood Vulnera	ibility Index (LVI)
			developed for ty	wo districts of Mo	zambique.
			Sub-	Explanation of	Survey question
			components	sub-	
				components	
			Percent of	Percentage of	Was anyone in your
			households	households	family injured in the
			with an injury	that reported	flood/cyclone drought?
			or death as a	either an	Did anyone in your
			result of the	injury to or	family die during the
			most severe	death of one	flood/cyclone/drought?
			natural	of their family	
			disaster in the	members as a	
			past 6 years	result of the	
				most severe	
				flood,	
				drought, or	
				cyclone in the	
				past 6 years.	
		Sampling strategies	Same as previous	construct	
		Sample sizes	Same as previous	construct	
		Data analysis	Same as previous		
154		Data collection	Same as previous		
	disaster	Operational questions			now each sub-component
			-		n used to collect the data,
			-	e of the survey qu	estion, and potential
			sources of bias.		
			[]		
					·
		1	L Table 1 Maior co	omponents and su	h-components

			comprising the L	ivelihood Vulnerat	oility Index (LVI)
			developed for tw	o districts of Moza	ambique.
			Sub-	Explanation of	Survey question
			components	sub-	
				components	
			Percent of	Percentage of	Did you receive a
			households	households	warning about the
			that did not	that did not	flood/cyclone/drought
			receive a	receive a	before it happened?
			warning about	warning about	
			the pending	the most	
			natural	severe flood,	
			disasters	drought, and	
				cyclone event	
				in the past 6	
				years.	
		Sampling strategies	Same as previous	construct	
		Sample sizes	Same as previous	construct	
		Data analysis	Same as previous		
155	maximum	Data collection	provincial data; w	eather station base	ed in the provincial
	temperature		capital		
		Operational questions			
			Table 1 Major co	mponents and sub	o-components
				ivelihood Vulnerat	
				o districts of Moz	
			Sub-components		
				sub-componen	
			Mean standard	Standard	1998–2003:
			deviation of the	deviation of th	
			daily average	average daily	weather station
			maximum	maximum	based in the
			temperature by	temperature b	
			month	month betwee	
				1998 and 2003	
				was averaged f each provinceb	
		Sampling strategies			,
		Sample sizes			
		Data analysis	Same as previous	construct	
156	minimum	Data collection	-		ed in the provincial
1.50	temperature		capital		
		Operational questions			
			Table 1 Maior co	mponents and sub	o-components
			-	ivelihood Vulnerat	-
				o districts of Moza	
			Sub-components		
				sub-componen	
			Mean standard	Standard	1998–2003:
			deviation of the	deviation of th	e provincial data;
			daily average	average daily	weather station

		minimum temperature by month	minimum temperature by month between 1998 and 2003 was averaged for each province.	based in the provincial capital
	Sampling strategies			
	Sample sizes			
	Data analysis			
157 average precipitation	Data collection	provincial data; wea capital	ather station <mark>based i</mark>	n the provincial
	Operational questions			
		Table 1 Major components and sub-componentscomprising the Livelihood Vulnerability Index (LVI)developed for two districts of Mozambique.		
		Sub-components	Explanation of sub-components	Survey question
		Mean standard deviation of average precipitation by month	Standard deviation of the average monthly precipitation between 1998 and 2003 was averaged for each province	1998–2003: provincial data; weather station based in the provincial capital
	Sampling strategies			
	Sample sizes			
	Data analysis	Same as previous co	onstruct	
Candidate-level Analysis	Same as 'dependency ra	atio'		

Information	Information relating to further development of framework			
Constructs w	Constructs with no adequate operationalizations			
FULLY AND A	FULLY AND ADEQUATELY OPERATIONALIZED			
Constructs w	Constructs with more than one adequate operationalizations			
Construct	Preference rank	Summary of operationalization		

Nested vulnerability

Framework summary

Name of framework: Nested Vulnerability

Description of framework:

This framework is concerned with 'teleconnections' between households in geographically distant localities. It examines the mechanisms through which smallholders in distinct geographical contexts respond differently to exogenous shocks (climatic or not-climatic) and in so doing create a new set of influences on distant locations through connections in a nested globally interconnected system.

Key constructs and definitions:

<u>Livelihood vulnerability (B)</u>: By placing the household as the focus of analysis, livelihood approaches highlight both the exogenous drivers (i.e. the risk and stress factors) and the factors internal to the household (i.e. ability to mitigate and cope with stress) which together influence household security and well-being (Chambers and Conway, 1992; Ellis, 1998). **Eakin et al (2008)**

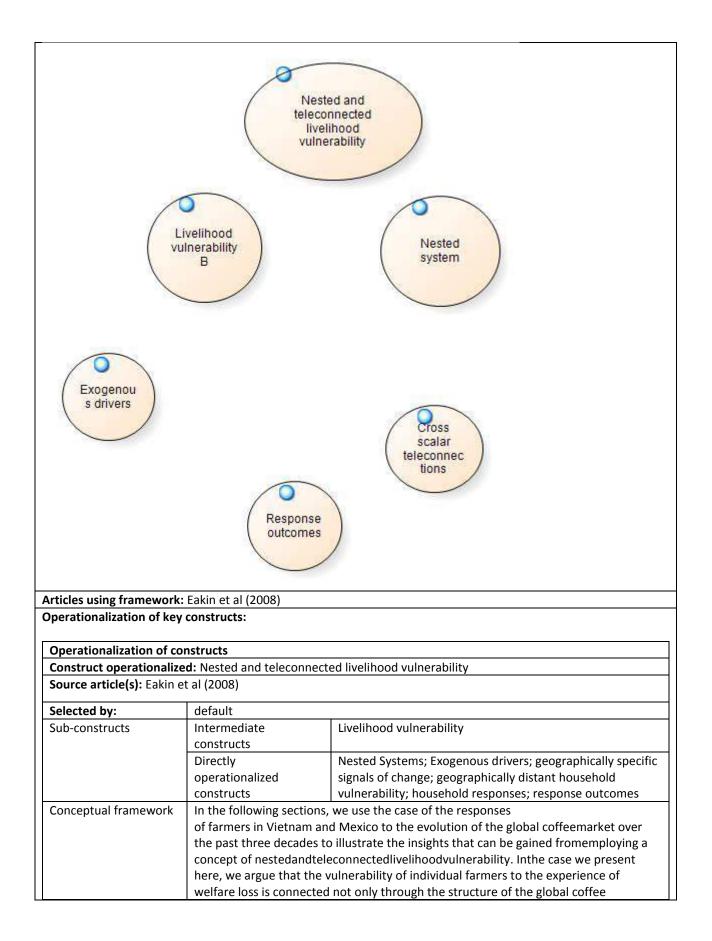
<u>Nested and teleconnected livelihood vulnerability</u>: In this article we use the concept of "nested and teleconnected vulnerabilities" to illustrate how the vulnerabilities and responses of farm households in distinct geographic locations are linked through cross-scalar processes, as well as "teleconnected" in space and time. In a nested system, profound changes in key variables that operate normally only at one level, e.g., within a defined geographic region or administrative domain, can have non-linear outcomes for processes operating at broader scales of analysis (Gunderson and Holling, 2001). **Eakin et al (2008)**

<u>Nested system</u>: In a nested system, profound changes in key variables that operate normally only at one level, e.g., within a defined geographic region or administrative domain, can have non-linear outcomes for processes operating at broader scales of analysis (Gunderson andHolling, 2001). Local level processes can episodically influence larger scale phenomena, and such explosive "upward cascades" can be sources of surprise at distant locations. **Eakin et al (2008)**

<u>Cross scalar teleconnections</u>: "teleconnections", a term used in climatology in relation to "any transmission of a coherent effect beyond the location where the forcing occurred" (Chase et al., 2005). For example, one of the teleconnections associated with the El Nino-Southern Oscillation effect is severe drought in Northeastern Brazil. Teleconnections are also associated with other climate phenomena such as the North Atlantic Oscillation. The label of "teleconnection" is not explanatory in and of itself, but rather signifies the existence of a correlation in events, and highlights the need to explore the connecting mechanisms and drivers in order to anticipate outcomes. **Eakin et al (2008)**

Exogenous drivers: exogenous drivers (i.e. the risk and stress factors) Eakin et al (2008)

<u>Response outcomes</u>: outcomes of these responses in terms of individual or household welfare. **Eakin et al (2008)** Ideal type model: (uneven)



		the movement of labor, and, in reverse, through local adaptive action. [] In this article we use the connected vulnerabilitie households in distinct ge as well as "teleconnecte inkeyvariablesthatopera region or admin- istrativ operating at broader sca [] Livelihood vulner- ability risks, and the outcomes welfare. [] In our case, we argue tha market opportunities, a	so through global ideological shifts affecting national policy, the material flow of coffee stocks, channels of information, the broader environmental and institutional impli- cations of concept of "nested and tele- s" to illustrate how the vulnerabilities and responses of farm cographic locations are linked through cross-scalar processes, d" in space and time. In a nested system, profoundchanges tenormallyonly at one level, e.g., within a defined geographic e domain, can have non-linear outcomes for processes iles of analysis (Gunderson andHolling, 2001) r is composed of exogenous risks, household responses to of these responses in terms of individual or household at geographically specific signals of change – such as a shift in drought, a change in public policy or new form of land use in create risks and opportunities
One	erationalization of		
	-constructs		
	Nested Systems	Data collection	NOT TRANSPARENT
		Operational questions	
		Sampling strategies	
		Sample sizes	
		Data analysis	
159	Exogenous drivers	Data collection	NOT TRANSPARENT
	U U	Operational questions	
		Sampling strategies	
		Sample sizes	
		Data analysis	
160	geographically	Data collection	NOT TRANSPARENT
	specific signals of	Operational questions	
	change	Sampling strategies	
		Sample sizes	
		Data analysis	
161	geographically	Data collection	NOT TRANSPARENT
	distant household	Operational questions	
	vulnerability	Sampling strategies	
		Sample sizes	
		Data analysis	
162	household	Data collection	NOT TRANSPARENT
	responses	Operational questions	
		Sampling strategies	
		Sample sizes	
		Data analysis	
163	•	Data collection	NOT TRANSPARENT
	outcomes	Operational questions	
		Sampling strategies	

	Sample sizes	
	Data analysis	
Candidate-level		
Analysis		

Constructs with no adequate operationalizations

NO ADEQUATE OPERATIONALIZATIONS

- Nested and teleconnected livelihood vulnerability (not adequately operationalized)

Constructs with more than one adequate operationalizationsConstructPreference rankSummary of operationalization

Nkondze et al

 Framework summary

 Name of framework: Nkondze et al (2013)

 Description of framework:

 At a very general level, this framework investigates factors affecting household vulnerability. An index is constructed through which to measure vulnerability, which is then analysed against socio-economic data to determine the most significant factors influencing levels of household vulnerability.

 Key constructs and definitions:

 Factors affecting vulnerability: No definition

 Household vulnerability to climate change: No definition

 Ideal type model:

 No defined constructs

 Articles using framework: Nkondze et al (2013)

 Operationalization of key constructs:

Information relating to further development of framework

Constructs with no adequate operationalizations NO OPERATIONALIZATIONS

Constructs with more than one adequate operationalizationsConstructPreference rankSummary of operationalization

Patterns of smallholder vulnerability

Framework summary

Name of framework: Patterns of smallholder vulnerability

Description of framework:

Cluster pattern analysis is employed in this framework to investigate whether there are, and which, characteristics that explain the causal structure of vulnerability to weather extremes. A measure of household/smallholder vulnerability is created using a combination of IPCC and Food Security household-level indicators. A cluster pattern analysis is then run relating measures of vulnerability to socio-economic and other household-level data to identify characterisitcs, and in particular combinations of characterisitcs that are related to concentrations of vulnerability.

Key constructs and definitions:

<u>Vulnerability (IPCC)</u>: The degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate variation to which a system is exposed, its sensitivity, and its adaptive capacity. **(Fussel & Klein 2006)**

Exposure: The nature and degree to which a system is exposed to significant climatic variations.

The exposure of a system to climate stimuli depends on the level of global cli- mate change and, due to the spatial heterogeneity of anthropogenic climate change, on the system's location (Fussel & Klein 2006)

<u>Sensitivity</u>: The degree to which a system is affected, either adversely or beneficially, by climate-related stimuli. [...] The effect may be direct [...] or indirect [...]

[...]

The sensitivity of a system denotes the (generally multi-factorial and dynamic) dose – response relationship between its exposure to climatic stimuli and the re- sulting impacts. **(Fussel & Klein 2006)**

<u>Adaptive capacity</u>: the adaptive capacity of smallholders (the term as used in this study encompasses the coping capacity) describes the ability to adjust to weather extremes, manage damages or explore alternative livelihood opportunities. **(Sietz et al 2012)**

<u>Cluster pattern analysis</u>: Without such a pre-selection, alternative approaches investigate the structure of the data space spanned by selected vulnerability indicators using cluster analysis. They deliver useful insights into recurrent indicator combinations based on similarities among units of analysis, in cases where such a grouping exists. For example, clustering revealed typical livelihood strategies employed by small-holders in Mexico and Botswana (Eakin 2005; Sallu et al. 2010). **(Sietz et al 2012)**

Food security: Food security is often discussed in terms of four

dimensions: food availability, access, stability of supply/ access and utilisation (FAO 2000). (Sietz et al 2012) Ideal type model:

Vulnerability IPCC Exposure Sensitivity Adaptive Capacity Cluster pattern analysis							
Articles using framework: (Sietz et al 2012) Operationalization of key constructs: Operationalization of constructs Construct operationalized: Vulnerability IPCC							
Operationalization of k Operationalization of	ey constructs: constructs						
Operationalization of k Operationalization of Construct operationa Source article(s):	ey constructs: constructs ized: Vulnerability IPCC						
Operationalization of k Operationalization of Construct operationa	ey constructs: constructs						
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Operationalization of k Operationalization of Construct operationa Source article(s): Selected by: Sub-constructs Conceptual framewor Operationalization of sub-constructs	ey constructs: ized: Vulnerability IPCC expert selection [justification] Intermediate constructs Directly operationalized constructs C Data collection Derational questions Operational questions						
Operationalization of k Operationalization of Construct operationalization Source article(s): Selected by: Sub-constructs Conceptual framewor Operationalization of sub-constructs 164	ey constructs: constructs ized: Vulnerability IPCC expert selection [justification] Intermediate constructs Directly operationalized constructs C Data collection Operational questions Sampling strategies Sample sizes Data analysis						
Operationalization of k Operationalization of Construct operationa Source article(s): Selected by: Sub-constructs Conceptual framewor Operationalization of sub-constructs	ey constructs: ized: Vulnerability IPCC expert selection [justification] Intermediate constructs Directly operationalized constructs C Data collection Operational questions Sampling strategies Sample sizes						
Operationalization of k Operationalization of Construct operationalization Source article(s): Selected by: Sub-constructs Conceptual framewor Operationalization of sub-constructs 164	ey constructs: constructs ized: Vulnerability IPCC expert selection [justification] Intermediate constructs Directly operationalized constructs C Data collection Operational questions Sampling strategies Sample sizes Data analysis						
Operationalization of k Operationalization of Construct operationalization Source article(s): Selected by: Sub-constructs Conceptual framewor Operationalization of sub-constructs 164	ey constructs: constructs ized: Vulnerability IPCC expert selection [justification] Intermediate constructs Directly operationalized constructs C Data collection Operational questions Sampling strategies Sample sizes Data analysis Data collection						
Operationalization of k Operationalization of Construct operationalization Source article(s): Selected by: Sub-constructs Conceptual framewor Operationalization of sub-constructs 164	ey constructs: ized: Vulnerability IPCC expert selection [justification] Intermediate constructs Directly operationalized constructs Data collection Operational questions Sampling strategies Sample sizes Data collection Operational questions Sample sizes Data collection Operational questions						
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Operationalization of k Operationalization of Construct operationalization Source article(s): Selected by: Sub-constructs Conceptual framewor Operationalization of sub-constructs 164	ey constructs: ized: Vulnerability IPCC expert selection [justification] Intermediate constructs Directly operationalized constructs C Data collection Operational questions Sampling strategies Sample sizes Data collection Operational questions Sample sizes Data collection Operational questions Sampling strategies						

		ampling strategies
		ample sizes
		ata analysis
167 •		ata collection
		perational questions
	Sa	ampling strategies
	Sa	ample sizes
	D	ata analysis
Candidate-level		
Analysis		
•	·	
Operationalizat	tion of consti	ructs
Construct operation	ationalized:	Cluster Pattern analysis
Source article(s		
Selected by:	default/exp	ert selection [justification]
Sub-	Intermedi	
constructs	ate	
	constructs	
ŀ	Directly	
	operation	
	alized	
	constructs	
Conceptual		I RATIONALIZATION
framework	DIRECTORE	
Operationaliz		
ation of sub-		
constructs		
168.	Data	The ALTAGRO (2006) data base contains detailed
100.	collection	quantitative information for 527 smallholder households collected through
	concetion	household questionnaires.
		[]
		The necessary weather information is available in good quality for the 1996–2006
		period for two stations located in Puno and Cabanillas (see Fig. 1). Table 2 shows
	Operation	the average pre- cipitation and temperature for both stations.
	Operation	Ten categories describe the smallholder households covering personal information
	al	about the family members (e.g. occupation, education level, age), production
	questions	systems (e.g. crop and livestock assets, labour input, processing and commer-
		cialisation of produce), weather conditions, food reserves, income, some expenses
		and credits.
		The following data are taken from the ALTAGRO
		(2006) data base to indicate the mechanisms relevant in this study. As the first
		dimension, the harvest failure risk is indicated by the number of production zones
		used for crop and pasture cultivation. The indicator considers plains, hillsides and
		hills. The second dimension of the area con- straint is measured by the crop area as
		an important pre- requisite for food production. The pasture area highly correlates
		to livestock keeping and is therefore reflected in the livestock measure. The third
		dimension, the livestock constraint, is characterised by the number and types of
		animals. To compare various animal species, we calculated standardized livestack
		animals. To compare various animal species, we calculated standardised livestock units in relation to an improved cattle variety based on the livestock-specific

representative ani is an essential con- reference to the ar productivity constru- crops potatoes and varieties and prod- since the productive fifth dimension of household head at four levels: no forr Finally, the lack of sum of annual mor People usually rece 495 members who mig	mals of each specie dition for livestock rea and productivit raint as the fourth d quinua. It average uction zones for ea vity of pastures is a education deprivat tended school. Sch nal education, prin alternative income netary income from eive remittances fr	keeping, the respective y of pasture land. Furth dimension is provided f es the household's prod ch crop. Again, we con lready included in the l ion relates to the num iool attendance is class hary, secondary and hig e as the sixth dimension h local off-farm activitie om household dependent labour, for d	Since fodder production e indicator contains a hermore, the for the major food ductivity across species, centrate on food crops livestock measure. The ber of years that a ified according to the gher edu- cation. h is quantified by the es and remittances.
[] Table 1 Indicator: capacity. The ran as well as lack of winsorisation, see ALTAGRO 2006)	s of households' se ge of the area and alternative income e description in tex		
Dimension of sensitivity and adaptive capacity	Indicator	Range	
Harvest failure risk	Number of production zones used for cultivation	1–3	
Area constraint	Crop area	0.1–1.3 ha/person ^a	
Livestock constraint	Livestock units	0.1–8.0 livestock units/person	
Productivity constraint	Potato productivity Quinua productivity	0.1–10.0 t/ha 0.2–1.8 t/ha	
Education deprivation	Education level of household head	1-4	
Lack of alternative income	Local off-farm income and remittances	0–2400 Soles/year*person	
a Average: 4 pers	sons per household]
period for two stat	tions located in Pur	s available in good qual no and Cabanillas (see F erature for both statior	Fig. 1). Table 2 shows

	Hidrologı'a del Peru', SENAMHI) Mean values for 1996–2006													
			1							-	-		_	-
		Ja n	Fe b	M ar	A pr	M ay	Ju n	Ju I	A ug	Se pt	Oc t	No v	De c	Tot al
	Precipita tion (mm)													
	Puno	20 1	16 1	13 8	6 0	7	3	4	14	27	51	48	88	80 1
	Cabanill as	16 6	16 5	11 2	5 6	6	1	3	11	19	54	55	91	73 8
	Mean tempera ture (@C)	0	5											0
	Puno	10 .8	10 .7	10 .6	9. 7	8. 1	6. 8	6. 8	7. 9	9. 3	10 .4	11 .0	11 .5	9.5
	Cabanill as	10 .6	10 .5	10 .5	9. 8	8. 6	7. 3	6. 9	8. 1	9. 6	10 .6	11 .1	11 .3	9.6
	Minimu m tempera ture (⊡C)													
	Puno	5. 7	5. 8	5. 4	3. 8	0. 8	- 0. 9	- 1. 1	0. 4	1. 9	3. 6	4. 3	5. 4	2.9
	Cabanill as	5. 3	5. 5	5. 2	3. 7	1. 1	- 0. 8	- 1. 5	0. 3	2. 1	3. 7	4. 2	5. 1	2.8
Sampling strategies Sample														
sizes	The eluctor									f				
Data The clust analysis exchange (MacQue reproduc whether share of expresse		lgoritl 1967 llity of e algo useho	hm, i.e 7; RDC f parti prithm plds th	e., hcl T 200 tions deteo at we	ust ar 9). Ba for a cts sta re ca	nd km ised o pre-gi able o tegori	eans, n sto ven r r uns sed ii	usin chast numb table n the	g the tic ini er of (inap same	statis tialisa cluste propi e clust	tics pa tion, v ers to riate) er in t	ackage we cal deterr partiti two pa	e R culate nine ions. T artitio	ed the The ns is
	the cluster pairwise co consistency analysed. Fi the cluster	result mpari meas urthe	s. We isons o sure e r metł	calcu of par nable nodolo	lated tition s us t ogical	the co s with o ider detai	onsist a giv ntify t Is are	tency ven n he op outl	v mea umbe ptima ined i	sure a er of c I num in a pi	as the luster ber of reviou	avera s. Ulti f clust is app	ge of matel ers to licatio	200 y, the be n of

Information	Information relating to further development of framework					
Constructs w	ith no adequate oper	ationalizations				
FULLY AND A	FULLY AND ADEQUATELY OPERATIONALIZED					
Constructs with more than one adequate operationalizations						
Construct	Preference rank	Summary of operationalization				

Perceptions of climate change

Framework summary

Name of framework: Perceptions of climate change

Description of framework:

This category constitutes less a coherent framework and more of a collection of studies whose approach differs significantly from the majority of studies in this review in terms of epistemological orientation and position on the intervention cycle. A tentative general description of this category is that the approach focusses on articulating perceptions of people whose livelihoods are affected by climate change (often farmers), and in particular their perceptions of climate change as a physical phenomenon, perceptions of the impact climate change has on their livelihoods, and respondent reported strategies of coping or adaptation.

Key constructs and definitions:

<u>Farmer perceptions</u>: there is an alternative approach which underscores how individuals perceive their environment and make decisions, with mal-adaptations attributed to problems in perception, cognition or the lack of available information (Diggs, 1991; Saarinen, 1966; Taylor et al., 1988). The main point is that from whatever level these adaptation measures are taken, the adaptation and coping measures depend on households' perceptions of extreme events and the problems associated with them (Davies, 1993). **(Mubaya et al 2012)** <u>Adaptation strategy</u>: Adaptations, or adaptive strategies, employed by individuals or groups are depicted as being mediated through their relative adaptive capacities, indicating that adaptations may or may not be accessed according to the distribution of various types of resources such as physical or social capital, as developed by Adger and Kelly (1999). **(Westerhoff & Smit 2009)**

Coping strategy: No definition

Ideal type model:

Insufficient defined constructs.

Articles using framework: Gandure et al (2013); Mengitsu (2011); Mubaya (2012); Westerhoff & Smit (2009) Operationalization of key constructs:

Operationalization of constructs

Construct operationaliz	Construct operationalized: Farmer perceptions					
Source article(s): Mubaya et al						
Selected by:	default					
Sub-constructs	Intermediate					
	constructs					
	Directly					
	operationalized					
	constructs					
Conceptual framework	DIRECETLY OPERATIONA	LIZED				
Operationalization of						
sub-constructs						
169 •	Data collection	The qualitative methods of data collection used include				
		Participatory Rural Appraisal (PRA) techniques such as				
		historical trend analysis and matrix scoring and ranking and				
		Focus Group Discussions (FGDs). The quantitative method				
		used is the household questionnaire survey.				
	Operational questions	2.2.2. Qualitative assessments FGDs were used to first of all				
		establish the general perceptions				
		regarding climate change and variability and their causes				
		and various stressors that confront farmers' livelihoods (see				

	Г	
		Appendix 2). Following this, it was considered important for
		this study to factor in how farmers regard climate change
		and variability as an obstacle to their livelihoods among the
		multiple stressors that they had identified. Among these
		stressors are climate variability in different forms, issues of
		financial capital, issues related to cattle pests and diseases,
		inadequate draught power, marketing issues and HIV and
		AIDS. A matrix scoring and ranking exercise was then
		facilitated for
		farmers. Farmers were asked as a group to select from the
		long list of stressors the ones they considered critical for
		the purposes of scoring and ranking. The second step
		involved participants defining criteria that they would use
		to evaluate these stressors. These criteria include food
		security, income generation, crop production and livelihood
		security. Through group consensus, farmers then decided
		how much to allocate each shock out of a total of 20 points,
		based on the group defined criteria. Historical trend lines
		were used to elicit information on specific historical trends
		in farmers' perceptions regarding changes in climate over a
		period of 20 years and as far back as they could recall.
		Specifically, participants were asked to recall major
		occurrences that had a bearing on climate and weather,
		community resources, and even the political situation. They
		were then asked to indicate what occurrences had the
		greatest impact on their livelihoods among the cited
		events.
		[]
		2.2.3. Quantitative assessments The questionnaire survey
		was used to collect household data
		and complement data generated through the qualitative
		methods. This survey collected data on changes in crops
		grown over a period of five years and reasons for these
		changes, indicators for good and bad crop production
		seasons and years considered to be good or bad over a ten
		year period. Questions in the survey also related to changes
		in weather patterns over a ten year period in relation to
		agriculture and what might have caused these changes.
		General household characteristics were also captured in
		this survey (see Appendix 1).
Si	ampling strategies	A sample of 720 households across countries was selected
		for
		the survey, 180 households per each of the four districts.
		Specifi- cally, systematic random sampling was employed to
		come up with six villages per district (making them 24
		across countries) and 30 households per each of these
		villages, making a total of 380 households per country (this
		study was part of a big inter- institutional research-based
		development project). For FGDs and PRA workshops, a
		group of eight to 15 participants
		was selected to represent the three villages per district,
		with approximately five representatives from each of the
		three villages per district. In coming up with this group,

Sub-constructs	Intermediate constructs	
elected by:	expert selection [jus	tification]
Source article(s):		
Operationalization of Construct operationation	f constructs alized: Adaptation strateg	у
	-	_
Analysis		
Candidate-level	DIRECTLY OPERATIC	NALIZED
		disaggregated by district and country.
		causes of these changes. These frequencies were
		patterns in general and for specific seasons and regarding
		themes include perceptions regarding changes in weather
		the distinct themes highlighted in this section. These
		Statistical Package for the Social Sciences (SPSS) and analysed by running descriptive frequencies in relation to
		Data from the questionnaire survey were entered into the
		discussion.
		presented in this manner in the sections under results and
		FGDs and matrix scoring and ranking and they are
		These perceptions were established in historical trend line
		relation to other stressors.
		climate, Perceptions regarding other stressors among farmers and Perceptions regarding climate change in
		Perceptions regarding causes of changes and variability in climate. Perceptions regarding other stressors among
		Perceptions regarding changes in weather patterns,
		distinct themes. These themes are
	Data analysis	Qualitative data were categorised and analysed in four
		three villages per district.
		with approximately five representatives from each of the
		was selected to represent the three villages per district,
		participants
		[] For FGDs and PRA workshops, a group of eight to 15
		the survey, 180 households per each of the four districts.
		for the survey 180 households per each of the four districts
	Sample sizes	A sample of 720 households across countries was selected
		by the elderly.
		to validate some of the recent trends on climate suggested
		context, youths were incorporated into the sample in orde
		provide rich information on these trends. In the same
		would be able to recall as far back as they could and
		historical trends in climate. Itwas envisaged that they
		group discussions in order to capture information related t
		confident if they were to be combined. Specifically, old me and women were incorporated into the sample for the
		of information that can be generated from the less
		women in order not to compromise the amount and qualit
		gender, separate PRA workshops were held for men and

	Directly	
	operationalized	
	constructs	
Conceptual framework		
Operationalization of		
sub-constructs		
170 •	Data collection	
	Operational questions	
	Sampling strategies	
	Sample sizes	
	Data analysis	
171 •	Data collection	
	Operational questions	
	Sampling strategies	
	Sample sizes	
	Data analysis	
172 •	Data collection	
	Operational questions	
	Sampling strategies	
	Sample sizes	
	Data analysis	
173 •	Data collection	
	Operational questions	
	Sampling strategies	
	Sample sizes	
	Data analysis	
Candidate-level		
Analysis		

Information	Information relating to further development of framework				
Constructs with no adequate operationalizations					
- Coping strategies (no operationalizations)					
Constructs with more than one adequate operationalizations					
Construct	Preference rank	Summary of operationalization			

Vulnerability as expected poverty, with extensions

Framework summary

Name of framework: Vulnerability as expected poverty, with extensions

Description of framework:

This framework conceives of vulnerability as the potential of a unit of analysis (usually a household) becoming or remaining poor in the future. It is an econometric approach that makes forward projections based on cross-sectional data and associated risks of climatic (and sometimes non-climatic) stress. In some cases, assessments of vulnerability based on expected poverty are then regressed against a series of socio-economic data to identify determinants of vulnerability.

Extension 1: This is a variant of the framework 'Vulnerability as Expected Poverty' described above. The principal difference is that whereas the former takes its focus as that of current and projected future levels of *poverty*, usually measured through consumption, the current framework by contrast focusses on a household's current and projected future *food security* status.

Extension 2: Another extension of the 'Vulnerability as Expected Poverty' framework described above. This variant is characterised by its inclusion of multi-level analysis. That is, projections are made for units of analysis at two different scales (usually household and community/local), and analysis is done of differences between units at different scales.

Key constructs and definitions:

<u>Vulnerability as Expected Poverty</u>: In this article, we explore the notion of vulnerability to poverty, closely linked with the magnitude of the threat of poverty, measured ex-ante, before uncertainty has been resolved.

[...]

To clarify how all these intuitions come together under the concept of vulnerability, this paper proposes an axiomatic approach to themeasurement of both individual and aggregate vulnerability. **(Calvo & Dercon 2012)** <u>Poverty</u>: This study adopts the approach to measuring household economic vulnerability posited and elaborated in Chaudhuri's (2003) study of household vulnerability

[...]

Technically, the household vulnerability index is derived from the difference between the expected log per capita income and the minimum log per capita income threshold, with households having per capita incomes lower than the minimum per capita income defined as vulnerable (poor). The expected log per capita income is estimated using the three-step feasible generalised least squares (FGLS) method. **(Chhinn & Poch 2012)**

Food insecurity: Food insecurityin the communities described by the

case studies maybe conceptualized as one element in an entrenched and escalating cycle of vulnerability (Fig. 3). (Misselhorn 2005)

Expected future food security status: conceptual framework drawn from it by Løvendal and Knowles (2005). (Capaldo et al 2010)

Future nutritional status: conceptual framework drawn from it by Løvendal and Knowles (2005).

(Capaldo et al 2010)

<u>Idiosyncratic shocks</u>: Households in developing countries are frequently hit by severe idiosyncratic and covariate shocks resulting in high income volatility. 1

[...]

1. Here, and in the following, idiosyncratic shocks refer to household- specific shocks (e.g., injury, birth, death, or job loss of a household member) that are only weakly correlated across households within a community. Covariate shocks refer to shocks that are correlated across households within communities but only weakly correlated across communities (e.g., natural disasters or epidemics). **(Gunther & hartgen 2009)**

<u>Covariate shocks</u>: Households in developing countries are frequently hit by severe idiosyncratic and covariate shocks resulting in high income volatility. 1

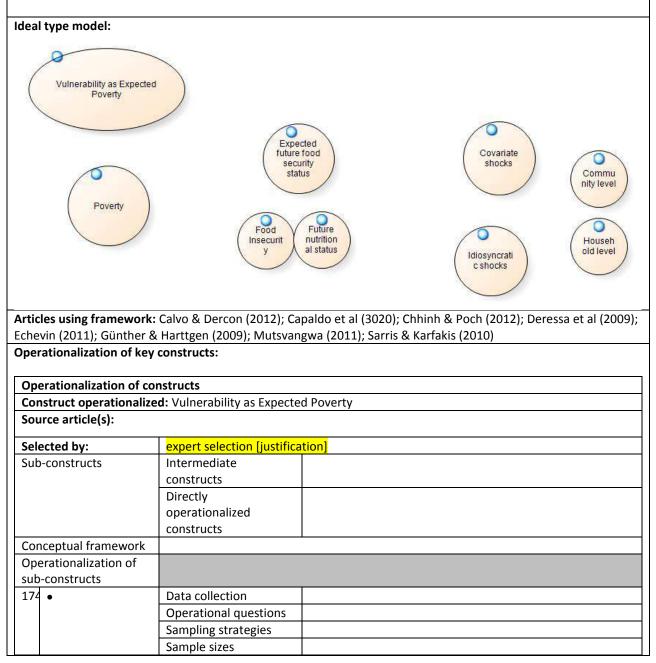
[...]

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shocks refer to shocks that are correlated across households within communities but only weakly correlated across communities (e.g., natural disasters or epidemics). **(Gunther & harttgen 2009)**

<u>Household level</u>: Multilevel models are designed to analyze the relationship between variables that are measured at different hierarchical levels (for an introduction see, e.g., Bryk & Raudenbush, 1992; Goldstein, 1999; Hox, 2002). We speak of "hierarchical" or "multilevel" data structure whenever variables are collected at different hierarchical levels with lower-levels (e.g., house- holds) nested within higher-levels (e.g., communities). **(Gunther & harttgen 2009)**

<u>Community level</u>: Multilevel models are designed to analyze the relationship between variables that are measured at different hierarchical levels (for an introduction see, e.g., Bryk & Raudenbush, 1992; Goldstein, 1999; Hox, 2002). We speak of "hierarchical" or "multilevel" data structure whenever variables are collected at different hierarchical levels with lower-levels (e.g., house- holds) nested within higher-levels (e.g., communities). **(Gunther & harttgen 2009)**



	Data analysis				
175 •	Data analysis Data collection				
1/3 •					
	Operational questions				
	Sampling strategies				
	Sample sizes				
	Data analysis				
176 •	Data collection				
	Operational questions				
	Sampling strategies				
	Sample sizes				
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177 •	Data collection				
	Operational questions				
	Sampling strategies				
	Sample sizes				
	Data analysis				
Candidate-level					
Analysis					
Operationalization of co	onstructs				
Construct operationaliz	ed: Expected future food se	ecurity status			
Source article(s): Capalo	lo et al (2010)	· · · · ·			
Selected by:	default				
Sub-constructs	Intermediate	Present food security status; events			
	constructs				
	Directly	Current socio-economic characteristics; current exposure to			
	operationalized	risks; Risks; risk management			
	constructs				
Conceptual framework		ne Social Risk Management approach (Holzmann and			
		Bank 2000) and, more specifically, on the conceptual			
		t by Løvendal and Knowles (2005). In this framework			
	-	of a recursive process: current socio-economic			
		sure to risks determine households' future characteristics and			
	<u> </u>	apacity. At every point in time households' current food			
	security status is affected by their past status and affects their future status. Figure 1				
	represents graphically this recursive connection.				
Operationalization of					
sub-constructs					
178 Current socio-	Data collection	We analyze a sample of 1831 rural households from			
economic		Nicaragua, surveyed in the 2001 Encuesta Nacional de			
characteristics		Hogares Sobre Medición de Nivel de Vida, by the Instituto			
		Nacional de Estadísticas y Censos INEC de Nicaragua.			
		Constructed variables used in the analysis were prepared by			
		the Rural Income Generating Activities (RIGA) project team			
		at FAO.			
	Operational questions	Information on the structure of a household includes the			
		age of the head of household (which is also a proxy for			
		working experience), gender, marital status, language			
		spoken (as a proxy for households belonging to an			
		indigenous group) and the share of female labor. The latter			
		also approximates labor availability within the household.			

We observed a relatively high proportion of single or female-headed household (23% and 13% respectively). Household assets are assessed in using education, as well as wealth-related variables (number of norms, cement floor, telephone, access to safe water, bikes, radios, TV sets owned4), and social capital different through participation of members in community organizations. Moreover, types of livestock and land assets are also taken into account to approximate household wealth and potential credit-related constraints. We use access to a network for migration as a measure of the ability of a household to receive assistance from members living outside the location and as a proxy of a diversified income portfolio. Distance from a road, school, and health facilities, are variables used for measuring a household's access to infrastructure. [] Table 1: Summary of variables Kilocatories per capita Age of hh head Highest education in hh Single head Female head of hh widow Female head of hh widow Female head of hh widow Female head of hh Hh hiador Indigenous household His is a some Rooms Cement floor in house Telephone in hh Hh members participating in comm. org. Access to safe water Bikes owned Radios owned Types Distance to nearest major road			ر ،
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Sampling strategies We analyze a sample of 1831 rural households from Nicaragua, surveyed in the 2001 Encuesta Nacional de Hogares Sobre Medición de Nivel de Vida, by the Instituto Nacional de Estadísticas y Censos INEC de Nicaragua.			Distance to nearest major road
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Nicaragua, surveyed in the 2001 Encuesta Nacional de Hogares Sobre Medición de Nivel de Vida, by the Instituto Nacional de Estadísticas y Censos INEC de Nicaragua.			
Nicaragua, surveyed in the 2001 Encuesta Nacional de Hogares Sobre Medición de Nivel de Vida, by the Instituto Nacional de Estadísticas y Censos INEC de Nicaragua.		Compliant starts size	
Hogares Sobre Medición de Nivel de Vida, by the Instituto Nacional de Estadísticas y Censos INEC de Nicaragua.		Sampling strategies	
Nacional de Estadísticas y Censos INEC de Nicaragua.			
			-
Constructed variables used in the analysis were prepared by			Constructed variables used in the analysis were prepared by

			the Rural Income Generating Activities (RIGA) project team at FAO.	
		Sample sizes	sample of 1831 rural households	
		Data analysis	After accounting for heteroskedasticity through the use of generalized least squares, we estimate vulnerability to food insecurity as the normal probability that the "individual minimum dietary energy requirement under light physical activity" exceeds the expected individual dietary energy consumption (measured in kilocalories). Since the main purpose of this paper is to propose a methodology to analyze and estimate vulnerability, we ignore possible econometric complications that are not directly relevant. However, by all means the results presented here are to be	
4.70			considered preliminary.	
179	current exposure	Data collection	Same as previous construct	
	to risks	Operational questions	We use ex-post data on shocks and risk management strategies. These include information on the incidence of a covariate shock (such as drought) and an idiosyncratic shock (illness) [] Table 1: Summary of variables Drought shock Illness shock	
		Sampling strategies	Same as previous construct	
		Sample sizes	Same as previous construct	
		Data analysis	Same as previous construct	
180	Risks	Data collection	NOT TRANSPARENT	
		Operational questions		
		Sampling strategies		
		Sample sizes		
		Data analysis		
181	risk management	Data collection	NOT TRANSPARENT	
		Operational questions		
		Sampling strategies		
		Sample sizes		
		Data analysis		
182		Data collection		
		Operational questions		
		Sampling strategies		
		Sample sizes		
		Data analysis		
	didate-level	-	eroskedasticity through the use of generalized least squares,	
Ana	llysis		y to food insecurity as the normal probability that the	
			tary energy requirement under light physical activity"	
		exceeds the expected individual dietary energy consumption (measured in		
		kilocalories). Since the main purpose of this paper is to propose a methodology to		
		analyze and estimate vulnerability, we ignore possible econometric complications that		
		-	. However, by all means the results presented here are to be	
		considered preliminary.		

Construct operationalize	ad: Idiosyncratic shocks	
Source article(s):	eu. IUIUSYIICIALIC SIIUCKS	
Source article(S):		
Selected by:	expert selection [justifica	tion]
Sub-constructs	Intermediate	
	constructs	
	Directly	
	operationalized	
	constructs	
Conceptual framework		
Operationalization of		
sub-constructs		
183 •	Data collection	
	Operational questions	
	Sampling strategies	
	Sample sizes	
	Data analysis	
184 •	Data collection	
	Operational questions	
	Sampling strategies	
	Sample sizes	
	Data analysis	
185 •	Data collection	
	Operational questions	
	Sampling strategies	
	Sample sizes	
	Data analysis	
186 •	Data collection	
	Operational questions	
	Sampling strategies	
	Sample sizes	
	Data analysis	
Candidate-level		
Analysis		
Operationalization of co	onstructs	
Construct operationalize	ed: Covariate shocks	
Source article(s):		
Selected by:	expert selection [justifica	tion
Sub-constructs	Intermediate	
	constructs	
	Directly	
	operationalized	
	constructs	
Conceptual framework		
Operationalization of		
sub-constructs		
187 •	Data collection	
	Operational questions	
	Sampling strategies	
	Sampling strategies	

	Sample sizes
	Data analysis
188 •	Data collection
	Operational questions
	Sampling strategies
	Sample sizes
	Data analysis
189 •	Data collection
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	Sample sizes
	Data analysis
190 •	Data collection
	Operational questions
	Sampling strategies
	Sample sizes
	Data analysis
Candidate-level	
Analysis	
Operationalization of co	onstructs
Construct operationalize	ed: Household level
Source article(s):	
Selected by:	expert selection [justification]
Sub-constructs	Intermediate
	constructs
	Directly
	operationalized
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Operationalization of	
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Operationalization of sub-constructs	constructs
Operationalization of sub-constructs	constructs Data collection
Operationalization of sub-constructs	constructs Data collection Operational questions
Operationalization of sub-constructs	constructs Data collection Operational questions Sampling strategies
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	Sample sizes	
	Data analysis	
Candidate-level		
Analysis		
Operationalization of co	nstructs	
Construct operationalize	ed: Community level	
Source article(s):		
Selected by:	expert selection [justification]	
Sub-constructs	Intermediate	
	constructs	
	Directly	
	operationalized	
	constructs	
Conceptual framework		
Operationalization of		
sub-constructs		
195 •	Data collection	
	Operational questions	
	Sampling strategies	
	Sample sizes	
	Data analysis	
196 •	Data collection	
	Operational questions	
	Sampling strategies	
	Sample sizes	
	Data analysis	
197 •	Data collection	
	Operational questions	
	Sampling strategies	
	Sample sizes	
	Data analysis	
198 •	Data collection	
	Operational questions	
	Sampling strategies	
	Sample sizes	
	Data analysis	
Candidate-level		
Analysis		
	-	

Information relating to further development of framework

Constructs with no adequate operationalizations

- Food insecurity (no operationalizations)
- Future nutritional status (no operationalizations)
- Expected future food security status (partially adequate operaiontalations)

Constructs with more than one adequate operationalizations		
Construct	Preference rank	Summary of operationalization

Appendix P: Questionnaire - candidate operationalizations

Instructions for review:

Each section of this questionnaire is concerned with a construct. Each section gathers together the different ways in which the given construct has been operationalized in the different papers. These are summarised in structured summary tables of candidate operationalizations, which contain information on the sub-constructs used to operationalize the main construct, the relationships between the constructs, data collection methods and operational questions used to generate raw data for each of the sub-constructs, and methods of analysis to draw findings at the level of the main construct.

The question you are asked to respond to is: for each construct, among the candidate operationalizations, choose three which you subjectively consider to be the most useful for CCAFS' study of vulnerability. Fill in your ordered preferences in the 'selection of most useful operationalizations' tables at the top of each section.

If you wish, you can compose a choice by merging elements from different candidates.

Adaptation strategy

Selection of most useful operationalizations (to be completed by expert reviewer)			
Construct Adaptation strategy			
1 st preference	[Author (year)]		
2 nd preference	2 nd preference [Author (year)]		
3 rd preference	3 rd preference [Author (year)]		

Structured summary of candidate operationalizations			
Candidate article: Eakin et al (2012)			
Construct operationalize	1 /		
Sub-constructs	Intermediate constructs		
	Directly operationalized		
	constructs		
Conceptual framework	DIRECT OPERATIONALIZA	ATION'	
Operationalization of			
sub-constructs			
1. •	Data collection	This study is based on 64 household surveys and additional in- depth expert and key-informant interviews, conducted in 2006 and 2007. The surveys implemented 18 months following Stan	
	Operational questions	The surveys, implemented 18 months following Stan, collected information regarding pre- and post-Hurricane Stan activities and income sources, house- hold demographics, land holdings, production attributes, hurricane impacts (to property, production and health and welfare), household assets before and after Stan and access to agricultural and emergency response services. As described later, the survey also captured households' per- ceptions and attitudes about the disaster and their suscep- tibility to damage. [] Table 2 Household assets in 2005 by impact class Land (in ha) in 2005 Percent land in coffee in 2005 Number of plots owned in 2005 Percentage of these plots in coffee in 2005 Coffee production in 2005 (kg) Coffee yields in 2005 (kg/Ha) Percentage of land in riverbed Planted maize (subsistence) in 2005 Percentage of households reporting poultry as very important for livelihood in 2005 [] Table 3 Impacts of Stan by impact cluster Coffee harvest loss Soil loss Average # of days with difficulty in acquiring basic needs following the hurricane Percentage of households reporting Total damages to the house Loss of coffee production equipment	

		Impacts to their health due to the hurricane
		Table 4 Income profiles pre- and post-Stan (2005 and
		2007)
		Percentage of household who received income from
		Coffee
		Other crops and/or cattle
		Agricultural wage laborer
		Non-farm activities
		Subsidies, pensions or other governmental support
		Remittances
		Number of income sources
		r .
		[]
		Table 5 Post-Stan actions by impact cluster
		Bought or rented new land
		New land for subsistence crops (maize and/or beans)
		Invested in soil conservation
		Shifted efforts to a new job
		Invested in hurricane protection
		Planted a new crop
		Planted shade trees
		[]
		Fig. 3 Recovery time for households and the community
		following Stan (Household was specifically asked: "How much
		time do you feel is necessary for your household [community]
		to fully recover from Stan?" Source: Authors' household
		survey)
Candidate-level	As a heuristic tool to aid in	our interpretation of impacts
Analysis		categorized households accord- ing to the exposure of their
7 (10) 515		ri- cane Stan into impact clusters. The impact clusters were
		luster method available through the statistical software,
		r anal- ysis uses a distance criterion (log-likelihood) to define
		s and allows for handling a mixture of categorical and
		vari- ables (Zhang et al. 1996; Chiu et al. 2001).
	[]	
		les as the input data for the
		nt of coffee harvest and soil lost due to Hurricane Stan. We
	-	because of the fundamental economic role played by coffee
	production for households	
	[]	
		rs to explore two questions through a descriptive analysis of
		bles: What were the characteristics of house- holds that
		es of loss? What were their responses?
	1	

Structured summary of candidate operationalizations			
Candidate article: Westerhoff & Smit			
Construct operationalize	Construct operationalized: Adaptation strategy		
Sub-constructs Intermediate constructs			

	Directly operationalized constructs	
Conceptual framework	DIRECT OPERATIONALIZA	ATION'
Operationalization of		
sub-constructs		
sub-constructs 1. •	Data collection	These were determined using a community-based approach similar to those used by Burton et al. (2002), Ford and Smit (2004) and Schröter et al. (2005), in which the factors and forces relevant to the community vulnerability were sought via primary and secondary sources. [] Most of the primary data were derived from 22 semi- structured, in-depth interviews with 11 male and 11 female community members, [] These community-member interviews were complemented by an additional 22 in-depth interviews with key informants from various governmental and non-governmental institutions in the area [] In addition, five focus groups were conducted with members of the community, [] The community-based data collection was complemented by a review of documents and records to extract information on the biophysical and socioeconomic forces contributing to vulnerability. Documents comprised existing studies completed in the area, government reports, climate data, and all other pertinent information. 22 semi-structured, in-depth interviews with 11 male and 11 female community members, who were asked to describe and explain in local terminology the various governmental and non-governmental institutions in the area for the purposes of obtaining further information on the relevant contributing biophysical/socioeconomic forces, exposure- sensitivities, adaptations, and adaptive capacities of importance to them. [] interviews with key informants from various governmental and non-governmental institutions in the area for the purposes of obtaining further information on the relevant contributing biophysical/socioeconomic forces, exposure- sensitivities, adaptations, and adaptive capac- ities in Mimkyemfre. [] five focus groups were conducted with members of the community, through which data on the experience of vulnerability by residents engaged in primary livelihood activities were gathered. Information on methods of farming, charcoal production and fishing, the stresses on these livelihoods, and the means for overcoming t

Candidate-level Analysis	Data from these multiple sources were coded, sorted and analyzed (in part using qualitative data analysis software) according to the themes of the conceptual model of vulnerability in order to identify relevant forces, exposure-sensitivities, adaptations and adaptive capacities experienced at the individual, household and community levels.
	adaptive capacities experienced at the movidual, household and community levels.

Adaptive capacity

Selection of most useful operationalizations (to be completed by expert reviewer)			
Construct Adaptive capacity			
1 st preference	[Author (year)]		
2 nd preference	[Author (year)]		
3 rd preference	3 rd preference [Author (year)]		

Structured summary of candidate operationalizations					
	ndidate article: Antwi				
	nstruct operationalize				
Sub	o-constructs	Intermediate constructs		Livelihoods; Livelihood capital assets	
		Directly operationalized		Social capital; financial capital; natural capital;	
		constructs		physical capital; human capital	
Со	nceptual framework	assets—human, finand overall vulnerability co	Traditionally, the SLA has been applied by considering the five livelihood capit assets—human, financial, natural, physical and social—as well as their links to overall vulnerability context, processes, institutions (both formal and informal) policies that govern people's access to these capital assets (Scoones 1998).		
-	erationalization of				
sub					
1.	Social capital	Data collection	not valio	l/feasible	
		Operational questions			
1.	Social capital Financial capital	Data collection	participa househo interview (Chambe transect includin provided features livelihoo question quantita househo and soci livelihoo farming	esented in this paper were collected using a mixture of atory methods such as focus group discussions, and questionnaire surveys and key informant ws. Data collection started with a rapid rural appraisal ers 1994) during which com- munity gatherings and walks were conducted with community members g opinion leaders at each of the 6 villages. This d an overview of the significant social and physical of the selected communities that influenced their d activities (Sallu et al. 2009). A household maire survey was used to collect both qualitative and tive data. The questionnaire survey assessed olds' capital assets (financial, human, natural, physical, al). This information was used to develop a household d vulnerability index (see Sect. 2.3). A total of 270 old ques- tionnaire surveys were conducted in the 6 communities (45 Questionnaires in each).	
		Operational questions	because Livestoc times of study co [] Househo with live assessed	information on financial assets was very problematic of a lack of records on sales and memory lapses. k were considered to offer readily available cash in crop failure due to erratic rainfall patterns in the mmunities. olds without poultry or livestock scored 1 whilst those stock scored 2. In addition, financial assets were l by examining the remittances received by the old from family members or friends over the past 12	

			months
			months. []
			L] Households that received remittances in the last 12 months
			scored 2 and those that did not receive any remittances
			scored 1. Access to credit may also influence adaptation to
			climate change including access to inputs such as improved
			cultivars of crops (e.g. Butt et al. 2006; Fosu-Mensah et al.
			2012). Hence, it is assumed that households that have no
			access to credit will be more vulnerable and scored 1 whilst
			those with access to credit were given a score of 2.
			[]
			Table 1 Indicators of household livelihood vulnerability index
			collected through a household survey across six communities
			in Ghana
			[]
			Access to credit
			Do you have access to credit for your agricultural activities?
			Ownership of livestock Do you have livestock or poultry? List the types and numbers
			of livestock.
			Remittances received
			Have you received remittances from family or friends in the
			last 12 months?
3.	Natural capital	Data collection	same as for 'financial capital'
5.		Operational questions	Natural capital assets were assessed by two indicators. The
		operational questions	first was the size of the farm holding under cultivation (this
			was estimated as the average area of cultivated land over the
			past 5 years) (Table 1). It is assumed that the larger the farm
			holding, the greater the opportunity for the household to
			have more crops and yield, and hence the lower the
			vulnerability to climate change, though it is noted that labour
			availability and financial capital both affect the reality of how
			much land can be cultivated. Households which cultivated less
			than 5 acres scored 1; those cultivating between 5 and 10
			acres scored 2; those cultivating between 11 and 15 acres
			scored 3; those cultivating 16-20 acres scored 4, and
			households cultivating [20 acres scored 5. The type of land
			tenure and level of security it provides may have serious
			implications for the management of agricultural soils and
			could indirectly affect crop productivity and environmental
			sustainability, conse- quently influencing household
			vulnerability (Butt et al. 2006). Three different tenure
			arrangements were identified in the study communities.
			These were "land inherited", "land purchased" and "land
			rented" by the household. A score of 1 was given to
			households who rented their farmlands; 2 for households
			who purchased their farmlands; and 3 for those who inherited
			who purchased their farmlands; and 3 for those who inherited
			who purchased their farmlands; and 3 for those who inherited their farmlands. Households that inherited their farm lands
			who purchased their farmlands; and 3 for those who inherited their farmlands. Households that inherited their farm lands were given the highest score because it is assumed that they
			who purchased their farmlands; and 3 for those who inherited their farmlands. Households that inherited their farm lands were given the highest score because it is assumed that they will have the most secure land tenure.

			in Ghana
			[]
			Farm holding size
			Could you please state the size of farm holding in acres?
			Tenure system
			By what arrangements do you have access to your farm land
		Data callection	for farming activities?
4.	Physical capital	Data collection	same as for 'financial capital'
	Operational questions		Physical assets that were assessed included the presence of irrigation facilities and own- ership of radios, television or mobile phones by a household (Table 1). Irrigation facilities are crucial for rain-fed agriculture-dependent households, as these facilities help farmers to practise dry season farming. It is assumed that households with irrigation facilities will be less vulnerable to changing rainfall patterns. Hence, households without irrigation facilities scored 1, whilst those with these facilities scored 2. The presence of radios, television or mobile phone in a rural household can be an effective tool for communication and accessing information on changing weather patterns (see Naab and Koranteng 2012). Here, households with any of these three assets scored 2, and those without any scored 1. Physical assets such as road networks and the availability of markets and health facilities may enhance the adaptive capacity of a household (see Zhang et al. 2007). These assets were not included in the vulnerability computation because field observations suggested that these physical assets did not significantly differ amongst either the resilient or vul- nerable communities. [] Irrigation facilities
			Do you have access to irrigation facilities for dry season
			farming?
			Ownership of radio, television or mobile phone
			Could you please list all communication gadgets that you
			have? These include TV, mobile phone or radios etc.
		Data collection	same as for 'financial capital'
		Operational questions	Human capital assets were represented by two indicators: the educational level of the head of the household (or the most educated person in the household) and the health status of the household (Table 1). No formal education was afforded a value of 1; 2 in the case of only primary education; 3 in the case of secondary education; and 4 for households that had tertiary education.
5.	Human capital		tertiary education. [] To assess health status, households were asked about the number of times they have been to the hospital (or hospitalised) within the last 12 months. House- holds with members that had been to the hospital were scored 1 whilst those with members that had not been to hospital as out patients (and those not needing any medical attention) within this period were scored 2. Also, situations where members of a household required hospital treatment but could not

	arrange transport and other resources needed were taken into consideration when scoring such a household. [] Table 1 Indicators of household livelihood vulnerability index collected through a household survey across six communities in Ghana [] Educational level Could you please state the highest education attained? Health status Have any member of this household been ill in the last 12 months?
Candidate-level Analysis	To ensure the comparability of indicators that were used in the construction of the household livelihood vulnerability index, all indicators were standardised following the UNDP (2007) procedure of standardising indicators for life expectancy index (Eq. 1). [] Having standardised the indicators, it was then necessary to elicit appropriate weights to them. An unequal weighting system, based on relative importance attached to each indicator by local households, extension officers, key informants and experts was used because it was deemed necessary to include the views of both local households and experts in the assessment. Hence, a five-point Likert scale was used where farmers, extension officers, key informants, and experts were asked to rank the five most important indicators that they considered to influence vulnerability at the household level (Table 2). The number of times a particular indicator was cited was used to generate the weighting system (Table 2). The following weights were assigned: 14 % to social capital, 11 % to human capital, 9 % to natural capital, 27 % to financial capital, 10 % to physical capital and 29 % to livelihood diversification (Table 2). The household livelihood vulnerability index for a household was then calculated using the following model (Eq. 2) (Vincent 2004). HLVI = (Sxvi X Wi) + (Hsvi X Wii) + (Ksvi X Wii) + (Fsvi X Wv) + (Lsvi X Wvi) where HLVI = household livelihood vulnerability index, Psvi = standardised value of financial capital asset sub-index, Psvi = standardised value of financial capital asset sub-index, Psvi = standardised value of physical capital asset sub-index, Nsvi = standardised value of natural capital asset sub-index. The Wi terms refer to the weighting that was applied to each standardised value: Wi = 0.14, Wii = 0.11, Wiii = 0.09, Wiv = 0.27, Wv = 0.10, and Wvi = 0.29 [] Quanti- tative data were transcribed and analysed using SPSS and Minitab (Edition 15). Using Minitab, a one-way ANOVA was computed to compare the relative vulnerability among the

Structured summary of candidate operationalizations Candidate article: Hahn et al

Со	nstruct operationalized: Adaptive capa	city				
Su	b-constructs	Intermediate constr	ructs	Socio-demographic profile; livelihood strategies; social network		
		Directly operationalized				
		constructs			re dependent ho	
					d diversification;	
					rcent of female h	
					lds; households v	
					ted headed house	-
); borrow-lend ra dent of local gove	
Co	nceptual framework	Adaptive capacity is	quantif			
•••		(e.g., percent of fen				
		strategies employed				
		natural resources to	o sell in t	he market	t), and the streng	th of social
		networks (e.g., perc	ent of r	esidents as	ssisting neighbors	s with chores).
	perationalization of sub-constructs		т.			
1.	Households working elsewhere	Data collection		hold surve	-	f h a h
		Operational questions			an explanation of was quantified, t	
		questions			-	
				iestion used to collect the data, the original urce of the survey question, and potential		
				es of bias.		
			[]]		
		com Vulr		Table 1 Major components and sub-		
				components comprising the Livelihood		
				Vulnerability Index (LVI) developed for two districts of Mozambique.		
			Sub-		Explanation	Survey
				ponents	of sub-	question
					components	
			Perc	ent of	Percentage	How many
				seholds	of	people in
				family	households	your family
				nber	that report at	go to a
				king in a erent	least 1 family member who	different community
				munity	works	to work?
			Com	manney	outside of	
					the	
					community	
					for their	
					primary work	
•	and the second	Data II II		I	activity.	
2.	agriculture dependent household	Data collection		hold surve	eys an explanation o	of how oach
		Operational questions			was quantified, 1	
		questions		-	o collect the data	-
			-		rvey question, ar	-
				es of bias.	, <u>, , , , , , , , , , , , , , , , , , </u>	
			[]			

			cor Vu dis Sur cor Per	mponents con Inerability Inc stricts of Moza	omponents and s mprising the Live dex (LVI) develop ambique. <i>Explanation</i> of sub- components Percentage of households	lihood
			sol agi a s	pendent lely on riculture as source of come	that report only agriculture as a source of income.	else in your household raise animals? Do you or someone else in your household grow crops? Do you or someone else in your household collect something from the bush, the forest, or lakes and rivers to sell?
3.	livelihood diversification Data collection Operational questions	Operational	Tabl sub- ques sour sour [] Tal cor Vu	-component v stion used to rce of the surv rces of bias. ble 1 Major co mponents cou	an explanation or vas quantified, the collect the data, vey question, an omponents and s mprising the Live dex (LVI) develop	he survey the original d potential sub- slihood
			dis Sul cor Ave Ag Liv Div Inc	stricts of Moza		

			household, e.g., A household that farms, raises animals, and collects natural resources will have a Livelihood Diversification Index = 1/(3 + 1) = 0.25.	animals? Do you or someone else in your household grow crops? Do you or someone else in your household collect something from the bush, the forest, or lakes and rivers to sell?
4. Dependency ratio	Data collection Operational questions	sub-component question used to source of the sur sources of bias. [] Table 1 Major c components co	an explanation of was quantified, th collect the data, vey question, and components and s mprising the Live dex (LVI) develop	ne survey the original d potential ub- lihood

				include	
				them as	
				well.	
percent of female headed households	Data collection	household surve	•	<u></u>	
	Operational questions	Table 1 includes an explanation of how each sub-component was quantified, the survey question used to collect the data, the original source of the survey question, and potential sources of bias. [] Table 1 Major components and sub- components comprising the Livelihood Vulnerability Index (LVI) developed for two districts of Mozambique.			
		Sub- components	Explanation of sub- components	Survey question	
households with orphans	Data collection	Percent of female- headed households household surve	Percentage of households where the primary adult is female. If a male head is away from the home >6 months per year the female is counted as the head of the household.	Are you the head of the household?	
	Operational questions	sub-component question used to	s an explanation of how each was quantified, the survey o collect the data, the original rvey question, and potential		
		components co	components and omprising the Live idex (LVI) develop zambique. <i>Explanation</i> of sub- components	elihood	
		Percent of households with orphans	Percentage of households that have at	Are there any children	

uneducated headed households	Data collection	Not valid/feasible	least 1 orphan living in their home. Orphans are children<18 years old who have lost one or both parents.	less than 18 years old from other families living in your house because one or both of their parents has died?
	Operational questions		-	
Receive-give ratio	Data collection Operational questions	household surver Table 1 includes sub-component question used to source of the sur sources of bias. []	an explanation o was quantified, tl collect the data,	he survey the original d potential
		components co Vulnerability In districts of Moz Sub- components	mprising the Live dex (LVI) develop ambique. <i>Explanation</i> of sub- components	lihood bed for two Survey question
		Average Receive:Give ratio (range: 0–15)	Ratio of (the number of types of help received by a household in the past month + 1) to (the number of types of help given by a household to someone else in the past month + 1).	In the past month, did relatives or friends help you and your family: (e.g., Get medical care or medicines, Sell animal products or other goods produced by family, Take care of children) In the past month, did you and your family help relatives or

			Ī	friends:
				(same
				choices as
				above)
borrow-lend ratio	Data collection	household surveys		,
	Operational	Table 1 includes an e	explanation of	how each
	questions	sub-component was	quantified, th	ie survey
		question used to coll	lect the data,	the original
		source of the survey	question, and	l potential
		sources of bias.		
		[]		
		Table 1 Major com		
		components compr	-	
		Vulnerability Index		ed for two
		districts of Mozamb	-	Comment
			kplanation f sub-	Survey question
		-	omponents	question
			atio of a	Did you
		0	ousehold	borrow any
			orrowing	money
		-	oney in the	from
		pa	ast month to	relatives or
		а	household	friends in
			nding	the past
			ioney in the	month? Did
			ast month,	you lend
			g., lf a	any money
			ousehold	to relatives
			orrowed ioney but	or friends in the past
			id not lend	month?
			ioney, the	monun
			itio = 2:1 or	
			and if they	
			nt money	
			ut did not	
			orrow any,	
		th	ne ratio = 1:2	
		or	r 0.5.	
independent of local government	Data collection	household surveys		
	Operational	Table 1 includes an e	-	
	questions	sub-component was quantified, the survey question used to collect the data, the original		
				-
		source of the survey sources of bias.	question, and	potential
		[]		
		[]		
		Table 1 Major com	ponents and s	ub-
		components compr	-	
		Vulnerability Index	(LVI) develop	ed for two

			districts of Moz	zambique.			
			Sub-	Explanation	Survey		
			components	of sub-	question		
				components			
			Percent of	Percentage	In the past		
			households	of	12 months,		
			that have not	households	have you or		
			gone to their	that reported	someone in		
			local	that they	your family		
			government	have not	gone to your		
			for assistance	asked their	community		
			in the past 12	local .	leader for		
			months	government	help?		
				for any			
				assistance in the past 12			
				months.			
Candidate-leve	Applysis	Rather than merge th			in one stop		
Canuluate-leve	I Allalysis	they are first combine					
		Table 2 using the follo	-	le categorization	i scheme in		
		$CF_d = [\sum_{i=1}^{n} W_{Mj} M_{di}]/$					
		where CFd is an IPC		outing factor (ex	xposure.		
		sensitivity, or adapti		<u> </u>	· ·		
		components for district d indexed by i, wMi is the weight of each					
		major component, an					
		each contributing fac	ctor.	-			

Sti	Structured summary of candidate operationalizations					
Са	Candidate article: Piya et al					
Со	Construct operationalized: Adaptive capacity					
Su	b-constructs	Intermediate construe	cts	Livelihood assets		
		Directly operationalize	ed	Physical capital; human capital; natural capital; financial		
		constructs		capital; social capital		
Conceptualadaptive capacity of a household is taken to be an emergent property of types of livelihood assets viz. physical, human, natural, financial, and soc						
-	perationalization of b-constructs					
5.	Physical capital	Data collection	survey c two pha	dy is based on the primary data collected by household onducted in ses. The first phase of household survey was conducted in y-March 2010 and the second phase in May-June 2011.		
		Operational questions	devices informa nearest and irrig	rs for the physical assets are type of house, ownership of to access tion (mobile phone and radio), walking distance to the road, and irrigated land. Out of these, only house quality gation are directly related to climate risks. Possession of uality house will improve the capacity to withstand the		

			risks from extreme climate events. Type of house was indicated from a value of 1-3, 3 indicating the most durable type of house (see Table 3). Ownership of mobile phone and radio will increase the adaptive capacity through access to weather related information. Better access to information enables a household in planning proactive adaptation measures against climate risks. Walking distance to the nearest motor road, which in this case is also equivalent to the nearest marketplace, is assumed to be inversely related to adaptive capacity as household located far away from the markets will be in a disadvantageous position for lacking the opportunity of income generation from alternative sources like non-farm labor, which help in securing livelihoods during the periods of food shortage or crop failure. Farther distance from the roads also symbolizes poor access to inputs as the service centers are located at the road-heads. In addition, greater distance from the motor roads also means limited access to information as the marketplace acts as informal gathering centers where information exchange takes place, and also the formal institutions providing extension services are located there. Irrigation is directly related to climate shocks as it minimizes risks posed by droughts. Higher percentage of irrigated land means lesser dependence on natural rain for agricultural purposes, which is becoming more unpredictable with climate change.Component IndicatorsDescription of the uhatch/wooden wall; 2 = thatch roof, stone+mud wall; 3 = stone/tin/tile roof,UnitHypothesized relation			
				stone/wood/brick+mud wall) Have devices to access information (mobile, radio) (0 = No, 1 = Yes)	Ordinal value	+
				Walking distance to nearest motor road Irrigated land	Hours % of total	+
6.	human capital	Data collection Operational questions	Same as 'physical capital' Human asset is represented by highest qualification in the family; trainings or vocational courses attended by the family members; and dependency ratio. These indicators are not directly related climate shocks; however they are still relevant because development of human capabilities through vocational trainings or formal education enable households to increase their income by undertaking skilled non-farm			

			farming and ga avert climate r household live posed by clima dependency ra members there	isks. Furthermo lihood sources v ate on farm inco atio will have mo eby reducing the dependency rati	y helping the re, it also div vhich help to me. Househ ore burdens e adaptive ca	e households to versifies b buffer the risks olds with higher on the earning	
			Component Indicators	Description of the Indicators	Unit	Hypothesized relation	
			Human Assets	Highest qualification in the family	Number of schooling years	+	
				Dependency Ratio	-	+	
				Trainings or vocational course attended by family members	Number	-	
7. na	tural capital	Data collection Operational questions	as an indicator assets. Chepan Paddyland (khe usually having which may or r than khet, but khoriya, which assets, by their climate shocks land types (khe khoriya face gr due to run-off share of khet a from climate d land (khet and sufficiency, the khoriya indicat bullock, which	land possessed l of natural ogs possess three et) is the most p an irrigation sou may not be irriga more productiv is unterraced sl r own nature, ar than other type et and bari) are l reater risks of lan during rains. Ho and bari compar- isasters. Higher bari) also mean us higher adaptiv	e categories roductive ca urce. Bari is t ated, and is l e than the th oppy land-p e more vuln es of assets. ess prone to ndslides and useholds po ed to khoriy share of mo s higher foo ve capacity. . Besides lan ns of plough	of land. Itegory of land, Perraced upland, Perraced uplan	
l			1				1

		[
			Assets	productive	total		
				land (khet +			
				bari)			
				possessed			
				Share of less	% of	+	
				productive	total		
				land (khoriya)			
				possessed			
				Have bullock	Ordinal	+	
					Urumar	Ŧ	
				(0 = No, 1 = 1)			
	6			Yes)			
8.	financial capital	Data collection	Same as 'physic				
		Operational		old annual income	, livelihood	d diversification	
		questions	index, househ	-			
			and ownership	o of small livestocl	k (goat, po	ultry, and pig) are	e
			taken as the ir	ndicators of financ	ial assets.	These indicators	
1			of financial as	sets are not specif	ic to climat	te shocks only.	
1			Gross annual i	ncome of the hou	sehold is tl	he sum total of	
			the cash and r	non-cash income f	rom 11 diff	ferent sources	
			shown in Appe	endix 2. Higher inc	ome mear	ns greater	
				resources at dispo			
			-	comes. Besides th		-	
				om which the inco			-
				. If all of the incon			
				ch income will be		-	
				ad weather. On th		-	
				n more than one s			
				nong the sources.			
				me, Livelihood Div			
			-	ther diversification			
				to switch among			
				ex of diversification		Kimenju &	
				9), which is calcula	ated as		
			Dk = 1 - ∑ _{i=1N}	(S _{i,k}) ²			
			where, Dk is t	he diversification i	ndex, i is tl	he specific	
			livelihood acti	vity, N is the total	number of	factivities being	
			considered, k	is the particular he	ousehold, a	and Si,k is the	
			share of ith ac	tivity to the total	household	income for kth	
			household (se	e Appendix 2). In a	addition to	income at	
			disposal, hous	eholds which are	able to ma	ke some savings	
				come will be able			
1				ke family education			
1				the times of need.			
			-	lso important sou	•	•	
				estock as buffer to			
				y back the loan th			
1			moneylenders	•	at they tak		
).			
1				Description	11	Live at la start	- I - I
1			Component	Description of	Unit	Hypothesized	
			Indicators	the Indicators		relation	-
			Financial	Gross	NRs	+	
			Assets	household			

							1	
					annual income			
					Livelihood	-	+	
					Diversification			
					Index			
					Total	NRs	+	
					household			
					savings			
					Ownership of	LSU	+	
					goat, poultry,			
					and pig			
					Memberships in CBOs	Number	+	
		Data collection	S	ame as 'physica				
		Operational			isset is represente	d by the n	umhe	r of
		questions		membership ir	•	a wy che fi		
				•	sed organizations	(CBOs) and	d acce	ess to credit.
				-	n CBOs will improv			
					access to information			
				contact with th	ne outsiders durin	g the meet	ings i	n CBOs. Also,
				management o	of resources like w	ater collec	tion t	anks and forests
				is done jointly	by the members o	of these CB	Os. Sı	uch activities
					risks across the h			-
					t is also taken as			
					ng loans from soc			
					tegies to cope wit			
					ay by selling agric			
					s. Thus, access to			
					he social safety n	-		
					ni-formal saving a		-	
				-	ve recently starte			
social cap	ital				investment like v ccess to productiv			
				-	s to existing credi			
					the access to cre		-	
				capacity of the		an, inglici	will b	
				Component	Description of the	ne Unit	t	Hypothesized
				Indicators	Indicators			relation
				Social	Memberships in	Nun	nber	+
				Assets	CBOs			
					Access to credit	-		+
					needed, but no	Valu	le	
					access; 2 = credi	t		
					used only for			
					subsistence	odit		
					purposes; 3 = cr			
					used for produc	live		
					investment +/- subsistence; 4 =	no		
					need)			
Candidate-lev	ما	Having chosen the sui	l L itak	l le indicators in		he norma	lized «	so as to bring
Canuluate-lev		having chosen the su	ιιαί	ne muicators, l	iow these need to	o de norma	nzeu s	o as to bring

Analysis	the values of the indicators within the comparable range (Nelson, et al., 2010b; Gbetibouo
- 1	& Ringler, 2009; Vincent, 2004). Normalization is done by subtracting the mean from the
	observed value and dividing by the standard deviation for each indicator.
	Normalized value = Observed Value / Mean standard deviation
	Next, weights should be assigned to these indicators.
	Assigning weight by Principal Component Analysis (PCA) following Filmer and Pritchett
	(2001) is thus preferred compared to the former two methods (Nelson et al., 2010b;
	Gbetibouo & Ringler, 2009; Cutter, Boruff, & Shirley, 2003). PCA was run for the selected
	indicators of exposure, sensitivity, and adaptive capacity separately in Data Analysis and
	Statistical Software (STATA10) software for assigning the weights. The loadings from the
	first component of PCA are used as the weights for the indicators. The weights assigned for
	each indicator varies between -1 and +1, sign of the indicators denoting the direction of
	relationship with other indicators used to construct the respective index. The magnitude of
	the weights describes the contribution of each indicator to the value of the index. PCA was
	run separately for the indicators of exposure, sensitivity and adaptive capacity. Stepwise
	PCA was run for the indicators of adaptive capacity. The first-step PCA was run for the
	indicators of each asset group separately to observe the relative importance of indicators
	within each asset category. From the weights obtained from first-step PCA, individual
	index values for each asset type was calculated. Second-step PCA was run using the index
	values for each of the five asset types to analyze which asset group contributes the most
	to the total adaptive capacity. Overall adaptive capacity index was calculated using the
	weights (loadings) obtained from the second step PCA run for the five asset categories.
	The normalized variables are then multiplied with the assigned weights to construct the
	indices (for exposure, sensitivity, and adaptive capacity separately) using the following
	formulae:
	$Ij = \sum_{i=1}^{k} b_i [(a_{ji} - x_i)/s_i]$
	where, 'I' is the respective index value, 'b' is the loadings from first component from PCA
	(PCA1) taken as weights for respective indicators, 'a' is the indicator value, 'x' is the mean
	indicator value, and 's' is the standard deviation of the indicators. Finally, vulnerability
	index for each household is calculated as: $V = E + S - AC$, where, V is the vulnerability
	index, E the exposure index, S is the sensitivity index and AC is the adaptive capacity index
	for respective household.

Structured summary of	Structured summary of candidate operationalizations					
Candidate article: Sietze	Candidate article: Sietze et al					
Construct operationalize	ed: Adaptive Capacity					
Sub-constructs	Intermediate constructs					
	Directly operationalized					
	constructs					
Conceptual framework	DIRECTLY OPERATIONALIZED					
Operationalization of	of					
sub-constructs						
2. •	Data collection	The ALTA	AGRO (2006) data base contains detailed			
		quantita	tive information for 527 smallholder households			
		collected	I through household questionnaires.			
	Operational questions	Ten cate	gories describe the smallholder households covering			
		personal	information about the family members (e.g.			
		occupati	on, education level, age), production systems (e.g.			
		crop and	livestock assets, labour input, processing and			
		commer	- cialisation of produce), weather conditions, food			

	I				
			reserves, income, s []	some expenses and	credits.
			The following data	are taken from the	ALTAGRO
					anisms relevant in this
			study. As the first o		
					n zones used for crop
			and pasture cultiva		
					on of the area con-
			straint is measured	l by the crop area a	s an important pre-
			requisite for food	production. The pas	sture area highly
			correlates to livest	ock keeping and is	therefore reflected in
			the livestock meas	ure. The third dime	nsion, the livestock
			constraint, is chara	cterised by the nur	nber and types of
				-	pecies, we calculated
					n to an improved cattle
					metabolism (Kleiber
			•	•	•
1			· -	-	e estimated using 20
					s in the study region.
1			•		I condition for livestock
1					ains a reference to the
			area and productiv		
					limension is provided fo
			-		iinua. It averages the
			household's produ	ctivity across speci	es, varieties and
			production zones f	or each crop. Agair	i, we concentrate on
			food crops since th	e productivity of pa	astures is already
			included in the live	stock measure. The	e fifth dimension of
			education deprivat	ion relates to the r	umber of years that a
			household head at	tended school. Sch	ool attendance is
			classified according	g to the four levels:	no formal education,
					ation. Finally, the lack of
				-	sion is quantified by the
					local off-farm activities
				•	ve remittances from
			household		
			495		
				rate for climate inc	lependent labour, for
			example mining an		•
			indicators used to		
			[]	assess vuinerability	•
1				s of households' se	nsitivity and adaptive
					ivestock constraints
				-	is provided following
				e description in tex	
1			ALTAGRO 2006)	Indiactor	Danaa
			Dimension of	Indicator	Range
			sensitivity and		
			adaptive		
			capacity		
			Harvest failure	Number of	1–3
			risk	production	
1			1 JK	zones used for	
	1			ZOTIES USED TOT	

					1		
			A	cultivation	011245		
			Area constraint	Crop area	0.1–1.3 ha/person ^a		
			Livestock	Livestock units	0.1–8.0 livestock		
			constraint		units/person		
			Productivity	Potato	0.1–10.0 t/ha		
			constraint	productivity	0.2–1.8 t/ha		
				Quinua			
				productivity			
			Education	Education level	1–4		
			deprivation	of household			
				head			
			Lack of	Local off-farm	0–2400		
			alternative	income and	Soles/year*person		
			income	remittances			
			a Average: 4 persons per household				
Car	Candidate-level In preparing the further analysis, we adjusted data sets with only a few extreme value						
Ana	alysis	to increase the influence of	of these data sets o	n the cluster partiti	ons. For example, the		
		majority of households po	ssess eight or fewe	r units of livestock.	The few households		
		with up to 39 livestock uni	its can be formally i	interpreted as singl	e outliers which skew		
		the overall data distribution	on of this indicator.	To deskew such da	ita sets and thus		
		adequately focus on the m	najority of househo	lds, we winsorised	the data sets, i.e.,		
		replaced the outlying obse	ervations (4%) with	the next available l	ess extreme observation		
		(Barnett and Lewis 1994).	This pro- cedure wa	as applied to the ar	ea and livestock		
		constraints as well as the a	alternative income.	All indicators were	then normalised to a 0-		
		1 range using the minimur	m–maximum values	s. Prior to the cluste	er analysis, we		
		determined correlations					
		between the selected indi	cators and the varia	ance distribu- tion i	n the data space. Firstly,		
		the correlation coefficient	s reached average a	absolute values of (0.11. The crop area and		
		livestock units correlate m	ost strongly here (0	0.46) reflec- ting the	e mixed production		
		systems. Furthermore, var	riables showing a la	rge variance may b	e intuitively expected to		
		contain most of the struct	ure information. Th	erefore, we explor	ed the variance of the		
		selected indicators using a	a principal compone	ent analysis (PCA). T	The PCA was per- formed		
		using the open source stat	tistics package R (RI	DCT 2009) following	g standard procedure		
		based on Pearson correlat	ions.				

Community level

Selection of most	Selection of most useful operationalizations (to be completed by expert reviewer)				
Construct Community level					
1 st preference	[Author (year)]				
2 nd preference	[Author (year)]				
3 rd preference	[Author (year)]				

Str	uctured summary of c	andidate operationalizatio	ons				
	Candidate article: Echevin						
Со	Construct operationalized: community level						
Su	b-constructs	Intermediate constructs					
		Directly operationalized					
		constructs					
Со	nceptual framework	DIRECTLY OPERATIONALI	ZED				
	erationalization of						
	o-constructs						
9.		Data collection	be norm the val (Nelsor 2004). the obs for eac <i>Norma</i> <i>deviat</i> Next, w [] Assigni followi compa 2010b; Shirley exposu Data A for assi compo indicat betwee directio constru weight value o indicat Stepwi capacit each as import the we	chosen the suitable indicators, now these need to malized so as to bring ues of the indicators within the comparable range n, et al., 2010b; Gbetibouo & Ringler, 2009; Vincent, Normalization is done by subtracting the mean from served value and dividing by the standard deviation h indicator. <i>alized value = Observed Value / Mean standard</i> <i>ion</i> <i>v</i> eights should be assigned to these indicators. Ing weight by Principal Component Analysis (PCA) ng Filmer and Pritchett (2001) is thus preferred red to the former two methods (Nelson et al., Gbetibouo & Ringler, 2009; Cutter, Boruff, & . 2003). PCA was run for the selected indicators of re, sensitivity, and adaptive capacity separately in nalysis and Statistical Software (STATA10) software gning the weights. The loadings from the first nent of PCA are used as the weights for the ors. The weights assigned for each indicator varies en -1 and +1, sign of the indicators denoting the on of relationship with other indicators used to uct the respective index. The magnitude of the s describes the contribution of each indicator to the f the index. PCA was run separately for the ors of exposure, sensitivity and adaptive capacity. se PCA was run for the indicators of adaptive y. The first-step PCA was run for the indicators of isset group separately to observe the relative ance of indicators within each asset category. From ights obtained from first-step PCA, individual index for each asset type was calculated. Second-step PCA			

· · · · · · · · · · · · · · · · · · ·	
Operational questions	was run using the index values for each of the five asset types to analyze which asset group contributes the most to the total adaptive capacity. Overall adaptive capacity index was calculated using the weights (loadings) obtained from the second step PCA run for the five asset categories. The normalized variables are then multiplied with the assigned weights to construct the indices (for exposure, sensitivity, and adaptive capacity separately) using the following formulae: $Ij = \sum_{i=1}^{k} b_i[(a_{ji} - x_i)/s_i]$ where, '1' is the respective index value, 'b' is the loadings from first component from PCA (PCA1) taken as weights for respective indicators, 'a' is the indicator value, 'x' is the mean indicator value, and 's' is the standard deviation of the indicators. Finally, vulnerability index for each household is calculated as: $V = E + S - AC$, where, V is the vulnerability index, E the exposure index, S is the sensitivity index and AC is the adaptive capacity index for respective household. Having chosen the suitable indicators, now these need to be normalized so as to bring.
	be normalized so as to bring the values of the indicators within the comparable range (Nelson, et al., 2010b; Gbetibouo & Ringler, 2009; Vincent, 2004). Normalization is done by subtracting the mean from the observed value and dividing by the standard deviation for each indicator. <i>Normalized value = Observed Value / Mean standard deviation</i> Next, weights should be assigned to these indicators. [] Assigning weight by Principal Component Analysis (PCA) following Filmer and Pritchett (2001) is thus preferred compared to the former two methods (Nelson et al., 2010b; Gbetibouo & Ringler, 2009; Cutter, Boruff, & Shirley, 2003). PCA was run for the selected indicators of exposure, sensitivity, and adaptive capacity separately in Data Analysis and Statistical Software (STATA10) software for assigning the weights. The loadings from the first component of PCA are used as the weights for the indicators. The weights assigned for each indicator varies between -1 and +1, sign of the indicators used to construct the respective index. The magnitude of the weights describes the contribution of each indicator to the value of the index. PCA was run separately for the indicators of exposure, sensitivity and adaptive capacity. Stepwise PCA was run for the indicators of adaptive capacity. The first-step PCA was run for the indicators of each asset group separately to observe the relative importance of indicators within each asset category. From the weights obtained from first-step PCA, individual index values for each asset type was calculated. Second-step PCA was run using the index values for each of the five asset

	types to analyze which asset group contributes the most to the total adaptive capacity. Overall adaptive capacity index was calculated using the weights (loadings) obtained from the second step PCA run for the five asset categories. The normalized variables are then multiplied with the assigned weights to construct the indices (for exposure, sensitivity, and adaptive capacity separately) using the following formulae: $Ij = \sum_{i=1}^{k} b_i[(a_{ii} - x_i)/s_i]$ where, '1' is the respective index value, 'b' is the loadings from first component from PCA (PCA1) taken as weights for respective indicators, 'a' is the indicator value, 'x' is the mean indicator value, and 's' is the standard deviation of		
	the indicator value, and s is the standard deviation of the indicators. Finally, vulnerability index for each household is calculated as: $V = E + S - AC$, where, V is the vulnerability index, E the exposure index, S is the sensitivity		
	index and AC is the adaptive capacity index for respective household.		
Candidate-level Analysis	We use self-reported shocks in order to estimate their impact on consumption and income.		
Table 3 presents OLS estimates and GLLAMM estimates. Both models are estim log consumption and log income. Our preferred specification regroups a large s explanatory variables such as household characteristics, regional dummies, con characteristics, interaction between household characteristics and community characteristics, shocks variables, interaction between shocks variables and hou characteristics, interaction between shocks variables and community character Estimating the two-level linear random coefficient model (GLLAMM) allows us decompose the variance of the residuals into an idiosyncratic variance and a co variance.			

Structured summary of c	Structured summary of candidate operationalizations				
Candidate article: Günth	er & Harttgen				
Construct operationalize	d: community level				
Sub-constructs	Intermediate constructs				
	Directly operationalized				
	constructs				
Conceptual framework	DIRECTLY OPERATIONALIZED				
Operationalization of					
sub-constructs					
10. •	Data collection	Not valid/feasible			
Operational questions					
Candidate-level					
Analysis					

Covariate shocks

Selection of most useful operationalizations (to be completed by expert reviewer)					
Construct Covariate shocks					
1 st preference	[Author (year)]				
2 nd preference	[Author (year)]				
3 rd preference	[Author (year)]				

Structured summary of candidate operationalizations								
Candidate article: Günther & Harttgen								
Construct operationalize	Construct operationalized: Covariate shocks							
Sub-constructs	Intermediate constructs							
	Directly operationalized							
	constructs							
Conceptual framework	DIRECTLY OPERATIONAL	IZED						
Operationalization of								
sub-constructs								
11. •	Data collection	Data on household characteristics are taken from the na- tional representative household survey of 2001 (Enque ^{te} Aupre's Des Me'nages), covering 5,080 households (1,778 ur- ban and 3,302 rural households) in 186 communities. The community census is the 2001 ILO/Cornell Commune Level census which covers 1,385 of the 1,395 communities in Mada- gascar. Both surveys do not have any time dimension.						
	Operational questions	More precisely, for each community and for the three years preceding the survey (2001, 2000, 1999) it is reported whether the community was exposed to any of 16 covariate shocks (most of these are reported in Tables A.1 and A.2 in Appendix). [] Table A.1. Households with exposure to shocks Malaria Tuberculosis Typhoid Cholera Rice pest Swineflu Newcastle Flooding Impassible bridge or road Drought Cyclones						
Candidate-level Analysis	for the whole sample are households. The expecte (log) poverty line, where households lies above th	nean and variance in consumption e presented in Table 3, also separately for rural and urban ed per capita (log) consumption of rural households is below the eas the expected per capita (log) consumption of ur- ban ne (log) poverty line. nated standard deviation in consumption, we show that the						

estimated standard deviation is slightly higher for rural households than for urban
households, with a standard deviation of 0.58 compared to 0.54 (Table 3). Idiosyn- cratic
variance is much higher than covariate variance for ur- ban and only slightly higher for
rural households. Hence, the relative importance of idiosyncratic variance is much
higher for urban than for rural households. More precisely, whereas among urban
households the estimated idiosyncratic standard deviation of consumption is 3.25 times
as high as covariate standard deviation, the respective rate is only 1.57 for rural
households. As a robustness check, we assume that half of the estimated idiosyncratic
variance is measurement error. The idiosyncratic standard deviation is still 2.13 as high
as covariate standard deviation for urban households and 1.14 as high for rural
households (see Table A.3).

Structured summary of candidate operationalizations									
Candidate article: Sarris	Candidate article: Sarris & karfakis								
Construct operationalize	Construct operationalized: Covariate shocks								
Sub-constructs	Intermediate constructs								
	Directly operationalized								
	constructs								
Conceptual framework	DDIRECLY OPERATIONAL	IZED							
Operationalization of									
sub-constructs									
12. •	ysis of the paper will be f 957 rural households in aro region, in November f 892 rural households in region in February-Mard d a year later stionnaire was designed onomic characteristics o s on their vulnerability t	n 45 vill 2003, n 36 vill ch 2004 to inve f house	lages done in the and a representative lages done in the I. The survey was estigate the complete sholds with a particular						
	Operational questions		Percentage of househol 1999 and 2003, by regi or not.		•				
		Health Death Illness Climati Drough	it						
		Agricul Harves Livesto Post ha Econor Cash cr Cereal	ck loss irvest cereal loss nic op price shock price shock iloyment						

		Fire/house destroyed			
		Land loss			
		Lana 1033			i .
Candidate-level	Table 5 exhibits the result	s of the (instrumental variable) re	oressio	ns on consumption	
Analysis		of consumption as per equations	-	-	
7 mary 515		ity analysis is the coefficient in the			of
		cerning the consumption per equ			
		and significantly on aggregate cro			
		d, several wealth variables such as			
		l and the lagged value of consume			
		nt in Ruvuma), access to credit var			ı
	variables.		labies,		
		test of the exogeneity of the crop	produ	ctivity strongly reject	ts
		eity, so IV is appropriate. Table 6 p			
		mates. We use as instruments a va			
	-	weather shock variables, and lagg	-	-	ie
		lizer and chemicals, as well as the			
		test does not invalidate the use of			
	_	t in the consumption regressions t			:
		significantly larger in the IV regre			
		tes for these coefficients are 0.02			
		0.144 and 0.411 for the IV regress			
	regions).	-			
	The consumption regressi	ons explain about 47 and 51 perce	ent of t	he variance of	
	consumption in Kilimanjar	o and Ruvuma respectively. The r	egressi	ons of the squared	
	residuals from the consum	nption regressions on the same ex	planat	ory variables as the	
	ones in the consumption r	egressions (excluding the variable	s that	are related to	
	covariate and idiosyncrati	c shocks) reveal that fewer of the	variabl	es are significant. In	
	Kilimanjaro the dependen	cy ratio, the value of the dwelling	, the nu	umber of small	
	animals, and the member	ship in a social group are significar	nt, whil	e in Ruvuma, the onl	ly
	two significant variables a	re the dummies for whether the h	ouseh	old receives	
	remittances and whether	the household has easy access to	season	al credit. The	
	regressions explain a rath	er small proportion of the error le	ss than	10 percent in both	
	regions). This suggests that	it unexplained components of con	sumpt	ion variability	
	dominate any parts that n	haybe due to structural household	specif	ic factors.	
		e average vulnerability index in Kil	-	-	
		oportions of the variance of consu	•		
		age consumption per capita and t		-	
		in both years of the survey. The f			
		limanjaro is much lower than in R			
		h the much larger poverty incider		-)
	Kilimanjaro that was indic	ated earlier (63.3 percent versus 3	89.5 pe	rcent).	

Exposure

Selection of most useful operationalizations (to be completed by expert reviewer)					
Construct Exposure					
1 st preference	[Author (year)]				
2 nd preference	[Author (year)]				
3 rd preference	[Author (year)]				

Structured summary of candidate operationalizations						
Candidate article: Baca et al						
Construct operationalize	d: Exposure					
Sub-constructs	Intermediate constructs					
	Directly operationalized					
	constructs					
Conceptual framework	DIRECTLY OPERATIONALI	IZED				
Operationalization of						
sub-constructs						
13. • Data collection The met climate suitabili (www.w [] To pred Global C used to sum of t		hodology combined current climate data with future change predictions. To map current climatic cy, the historical climate database WorldClim orldclim.org) was used ct future climate, the SRES-A2a scenario 19 IPCC irculation Models were used. The Delta method was down-scale the climate change data, based on the he anomalies interpolated with the WorldClim high- resolution surfaces [15].				
	Operational questions	database variables from mo minimur	current climatic suitability, the historical climate e WorldClim (www.worldclim.org) was used. The s included a total of 19 bioclimatic variables derived onthly precipitation, monthly median temperature, n and maximum temper- ature [15]. Bioclimatic s represent annual trends, season- ality, and extreme ns.			
Candidate-level	The Maximum entropy (N	MAXENT) r	nethod, a general-purpose			
Analysis	method for making predi used to predict the future with climate data for cur coordinates. The model a suitable or unsuitable for This assumption is reason significantly change. It th suitability for a crop if the adaptations in crops and consequences of a predic been used for coffee [6], agreement	ictions or i e climatic rent coffee assumes the the crop a nable as lo ous predict ese factors cropping cted declin [18]. Two	nferences based on incomplete information [17], was suitability for coffee. The model requires calibration e production areas, which is provided by GPS hat a certain future climate at a given site is as as is the same climate at another site in the present. Ing as crop genetics and cropping systems do not s what will happen in terms of relative climatic s do not change and helps identify those sites where systems are necessary in order to avoid the e in climatic suitability. This approach has previously measures of uncertainty were calculated: (1) the ge of models that predict changes in the same			

direction and (2) the coefficient of variation (CV) among models.
For exposure, the relative decreases in climatic suitability according to the MAXENT model were divided into three classes of suitability loss (low, medium, high). For sensitivity and adaptive capacity, indicators were identified and quantified through interviews with the farming families.
[] Each factor (exposure, sensitivity and adaptive capacity), as previously explained, and was classified into three levels (high, medium, low). To calculate the vulnerability equation we assigned each level a quantitative value: low=1, medium=2, high=3. With three factors and three levels per factor, we obtained 27 possible combinations. After applying the equation we obtained 7 values (-1,0,1,2,3,4,5), which we used to define
low (-1,0), medium (1,2,3,) and high (4,5) levels of vulnerability (Figure 1). A Principal Components Analysis (PCA) was carried out to identify the indicators that most contribute to the sensitivity or adaptive capacity of families in different municipalities.

Str	uctured summary of candi	date operationalizations					
Car	didate article: Hahn et al						
Со	nstruct operationalized: E>	rposure					
Sub-constructs		Intermediate constructs		Natural disaster and climate change		nate change	
		Directly operationalized		Flood, drought, cyclone events; injury or death			
		constructs		from disaster; no warning of disaster; maximum			
				-		temperature; average	
				precipit			
Coi	nceptual framework	Exposure of the study po	-				
		that have occurred in the		-		• •	
		average standard deviat				monthly temperatures	
0		and monthly precipitation	on over a 6	b-year pe	eriod.		
-	erationalization of sub- structs						
14.		Data collection	household surveys				
14.	events	Operational questions			•	of how oach sub	
	events	Operational questions	Table 1 includes an explanation of how each sub- component was quantified, the survey question used to				
			collect the data, the original source of the survey question,				
			and potential sources of bias.			,	
			[]				
			Table 2	Table 1 Major components and sub-components			
			-	-		rability Index (LVI)	
				ped for t	wo districts of M	· · · · · · · · · · · · · · · · · · ·	
			Sub-		Explanation	Survey question	
			сотро	nents	of sub-		
					components		
			Averag		Total number	How many times has	
			numbe	er of	of floods,	this area been	
			flood,		droughts, and	affected by a	
			drough	-	cyclones that	flood/cyclone/drought	
			cyclon		were	in 2001–2007?	
			events	in the	reported by		

			in a st C	haussball	T
			past 6 years	households in	
			(range: 0–7)	the past 6	
				years.	
15.				•	
15.	injury or death from disaster	Data collection Operational questions	component was collect the data, and potential so [] Table 1 Major comprising the	an explanation of quantified, the s the original sour- purces of bias. components and two districts of N <i>Explanation</i> of sub- components Percentage of households that reported either an injury to or death of one of their family members as a result of the most severe flood,	of how each sub- survey question used to rce of the survey question, sub-components erability Index (LVI) Aozambique. Survey question Was anyone in your family injured in the flood/cyclone drought? Did anyone in your family die during the flood/cyclone/drought?
				drought, or cyclone in the past 6	
				years.	
16.	no warning of disaster	Data collection	household surve		
10.		Operational questions	Table 1 includes component was	an explanation of quantified, the s	of how each sub- survey question used to rce of the survey question,
			comprising the		Survey question

1				1	
				about the	
				most severe	
				flood,	
				drought, and	
				cyclone event	
				in the past 6	
				years.	
17.	maximum temperature	Data collection	provincial data; w	eather station based i	n the provincial
			capital		
		Operational questions			
			Table 1 Major co	mponents and sub-co	omponents
			comprising the L	ivelihood Vulnerabilit	y Index (LVI)
			developed for tw	o districts of Mozam	bique.
			Sub-components	Explanation of	Survey question
				sub-components	
			Mean standard	Standard	1998-2003:
			deviation of the	deviation of the	provincial data;
			daily average	average daily	weather station
			maximum	maximum	based in the
			temperature by	temperature by	provincial
			month	month between	capital
				1998 and 2003	
				was averaged	
				for each	
				provinceb	
		Data collection	provincial data; w	eather station based i	n the provincial
			capital		
		Operational questions			
			Table 1 Major co	mponents and sub-co	omponents
				ivelihood Vulnerabilit	
					,
			developed for tw	o districts of Mozam	nane
1			developed for tw		
			developed for tw Sub-components	Explanation of	Survey question
	minimum temperature		Sub-components	Explanation of sub-components	Survey question
	minimum temperature		Sub-components Mean standard	Explanation of sub-components Standard	Survey question 1998–2003:
	minimum temperature		Sub-components Mean standard deviation of the	Explanation of sub-components Standard deviation of the	Survey question 1998–2003: provincial data;
	minimum temperature		Sub-components Mean standard deviation of the daily average	Explanation of sub-components Standard deviation of the average daily	Survey question 1998–2003: provincial data; weather station
	minimum temperature		Sub-components Mean standard deviation of the daily average maximum	Explanation of sub-components Standard deviation of the average daily maximum	Survey question 1998–2003: provincial data; weather station based in the
	minimum temperature		Sub-components Mean standard deviation of the daily average maximum temperature by	Explanation of sub-componentsStandard deviation of the average daily maximum temperature by	Survey question 1998–2003: provincial data; weather station based in the provincial
	minimum temperature		Sub-components Mean standard deviation of the daily average maximum	Explanation of sub-componentsStandard deviation of the average daily maximum temperature by month between	Survey question 1998–2003: provincial data; weather station based in the
	minimum temperature		Sub-components Mean standard deviation of the daily average maximum temperature by	Explanation of sub-componentsStandard deviation of the average daily maximum temperature by month between 1998 and 2003	Survey question 1998–2003: provincial data; weather station based in the provincial
	minimum temperature		Sub-components Mean standard deviation of the daily average maximum temperature by	Explanation of sub-componentsStandard deviation of the average daily maximum temperature by month between 1998 and 2003 was averaged	Survey question 1998–2003: provincial data; weather station based in the provincial
	minimum temperature		Sub-components Mean standard deviation of the daily average maximum temperature by	Explanation of sub-componentsStandard deviation of the average daily maximum temperature by month between 1998 and 2003 was averaged for each	Survey question 1998–2003: provincial data; weather station based in the provincial
	minimum temperature	Data collection	Sub-components Mean standard deviation of the daily average maximum temperature by month	Explanation of sub-componentsStandard deviation of the average daily maximum temperature by month between 1998 and 2003 was averaged	Survey question 1998–2003: provincial data; weather station based in the provincial capital
	minimum temperature		Sub-components Mean standard deviation of the daily average maximum temperature by month	Explanation of sub-componentsStandard deviation of the average daily maximum temperature by month between 1998 and 2003 was averaged for each provinceb	Survey question 1998–2003: provincial data; weather station based in the provincial capital
		Data collection Operational questions	Sub-components Mean standard deviation of the daily average maximum temperature by month	Explanation of sub-componentsStandard deviation of the average daily maximum temperature by month between 1998 and 2003 was averaged for each provinceb	Survey question 1998–2003: provincial data; weather station based in the provincial capital
	minimum temperature		Sub-components Mean standard deviation of the daily average maximum temperature by month provincial data; w capital	Explanation of sub-componentsStandard deviation of the average daily maximum temperature by month between 1998 and 2003 was averaged for each provincebprovinceb eather station based i	Survey question 1998–2003: provincial data; weather station based in the provincial capital n the provincial
			Sub-components Mean standard deviation of the daily average maximum temperature by month provincial data; w capital Table 1 Major co	Explanation of sub-componentsStandard deviation of the average daily maximum temperature by month between 1998 and 2003 was averaged for each provinceb eather station based is	Survey question 1998–2003: provincial data; weather station based in the provincial capital n the provincial
			Sub-components Mean standard deviation of the daily average maximum temperature by month provincial data; w capital Table 1 Major co comprising the L	Explanation of sub-componentsStandard deviation of the average daily maximum temperature by month between 1998 and 2003 was averaged for each provincebprovinceb eather station based i	Survey question 1998–2003: provincial data; weather station based in the provincial capital n the provincial omponents y Index (LVI)

		Sub-components	Explanation of sub-components	Survey question
		Mean standard deviation of the daily average maximum temperature by month	Standard deviation of the average daily maximum temperature by month between 1998 and 2003 was averaged for each provinceb	1998–2003: provincial data; weather station based in the provincial capital
Candidate-level Analysis	Rather than merge the m combined according to th equation: $CF_d = [\Sigma^{n}_{i=1} W_{Mj} M_{di}] / [\Sigma^{n_i}$ where CFd is an IPCC-de adaptive capacity) for di indexed by i, wMi is the major components in ea	e categorization sch =1 WMi] efined contributing istrict d, Mdi are the weight of each majo	eme in Table 2 using factor (exposure, so e major component or component, and	g the following ensitivity, or s for district d

Structured summary of o	andidate operationalizatio	ons				
Candidate article: Noten	Candidate article: Notenbaert et al					
Construct operationalize	Construct operationalized: Exposure					
Sub-constructs	Intermediate constructs					
	Directly operationalized					
	constructs					
Conceptual framework	DIRECTLY OPERATAIONA	LIZED				
Operationalization of						
sub-constructs						
18. •	Data collection	and varia Difference exposure and adap [] We also is sensib district a analysis. complex not nec-	udy, we assume the exposure to climate change ability of households in the same village to be equal. ces in vulnerability, described as outcomes of this e, are therefore attributed to differences in sensitivity believe that the overall assumption of equal exposure le in the fairly homogenous landscape of Mabalane nd the relatively clustered villages as our unit of When analyzing communities spread out in more land- scapes or in rugged terrain, this assumption will essarily hold true			
	Operational questions	and varia Different exposure and ada []	udy, we assume the exposure to climate change ability of households in the same village to be equal. ces in vulnerability, described as outcomes of this e, are therefore attributed to differences in sensitivity otive capacity only. believe that the overall assumption of equal exposure			

	is sensible in the fairly homogenous landscape of Mabalane district and the relatively clustered villages as our unit of analysis. When analyzing communities spread out in more complex land- scapes or in rugged terrain, this assumption will not nec- essarily hold true
Candidate-level Analysis	 In this study, we assume the exposure to climate change and variability of households in the same village to be equal. Differences in vulnerability, described as outcomes of this exposure, are therefore attributed to differences in sensitivity and adaptive capacity only. [] We also believe that the overall assumption of equal exposure is sensible in the fairly homogenous landscape of Mabalane district and the relatively clustered villages as our unit of analysis. When analyzing communities spread out in more complex land- scapes or in rugged terrain, this assumption will not nec- essarily hold true

Structured summary of c	andidate operationalizatio	ons				
Candidate article: Piya et	Candidate article: Piya et al					
Construct operationalized: Exposure						
Sub-constructs	Intermediate constructs					
	Directly operationalized					
	constructs					
Conceptual framework	DIRECLY OPERATIONALIZ	ED				
Operationalization of						
sub-constructs						
19.	Data collection Operational questions	househo two pha conduct May-Jun [] The latit were rec paper al maximum monthly Hydrolog the time data was from 213 tempera interpola the latitu by ordin 3.2.1 Exp variables	ly is based on the primary data collected by Id survey conducted in ses. The first phase of household survey was ed in February-March 2010 and the second phase in e 2011. ude, longitude and altitude of the sample households corded during the second phase of field visit. This so makes use of raw monthly minimum and m temperature and precipitation data obtained from Department of gy and Meteorology (DHM) in Kathmandu, Nepal for period of 32 years, from 1977-2008. Temperature s obtained from 49 stations and precipitation data 8 stations distributed all over the country. The ture and precipitation at the household level was ated for each year from the weather stations using ude-longitude-altitude information of each household ary kriging method in ArcGIS 10. posure For this study, historical changes in climate s and occurrence of extreme events are taken as indicators of exposure (Table 1).			
		average precipita historica	hange in average annual maximum temperature, annual minimum temperature and average annual ition for the time period of 1977–2008 represent the I climate changes. The temperature and precipitation idual household was interpolated for each year from			

	precipitation s altitude inform ordinary krigin trends of clima household. Flo most common Number of occ ten years was household sum higher the rate the frequency of the household	ly occurring natu surrence of these obtained for eac vey (Appendix 1 e of change of th	e latitude, lon tions and the GIS10. The co alculated sepa droughts and ural disasters i e extreme eve th household f). It was hypot e climate vari ters, higher wi hange and ext	gitude, and households by efficient of the mately for each hailstorms are the in the study area. Ints for the last from the chesized that ables and higher II be the exposure
	Component Indicators	Description of the Indicators	Unit	Hypothesized relation
	Historical change in climate Variables	Rate of change in average annual minimum temperature (1977 – 2008)	Coefficient of trend	+
		Rate of change in average annual maximum temperature (1977 – 2008)	Coefficient of trend	+
		Rate of change in average annual precipitation (1977 – 2008)	Coefficient of trend	+

	Extreme Frequency of climate Number + climate climate related natural disasters (floods, (floods, and hailstorms) over the last
Candidate-level Analysis	Having chosen the suitable indicators, now these need to be normalized so as to bring the values of the indicators within the comparable range (Nelson, et al., 2010b; Gbetibouo & Ringler, 2009; Vincent, 2004). Normalization is done by subtracting the mean from the observed value and dividing by the standard deviation for each indicator. <i>Normalized value = Observed Value / Mean standard deviation</i> Next, weights should be assigned to these indicators. [] The normalized variables are then multiplied with the assigned weights to construct the indices (for exposure, sensitivity, and adaptive capacity separately) using the following formulae: $Ij = \sum_{i=1}^{k} b_i[(a_{ji} - x_i)/s_i]$ where, '1' is the respective index value, 'b' is the loadings from first component from PCA (PCA1) taken as weights for respective indicators, 'a' is the indicator value, 'x' is the mean indicator value, and 's' is the standard deviation of the indicators. Finally, vulnerability index for each household is calculated as: $V = E + S - AC$, where, V is the vulnerability index, E the exposure index, S is the sensitivity index and AC is the adaptive capacity index for respective household.

Structured sur	Structured summary of candidate operationalizations					
Candidate arti	Candidate article: Sietz et al					
Construct oper	Construct operationalized: Exposure					
Sub-	Intermediat	e constructs				
constructs	Directly ope constructs	rationalized				
Conceptual framework	Directly ope	Directly operationalized				
Operationaliz ation of sub- constructs						
20 •	Data collection	The necessary weather information is available in good quality for the 1996–2006 period for two stations located in Puno and Cabanillas (see Fig. 1). Table 2 shows the average pre- cipitation and temperature for both stations.				
	Operation al questions	peration The necessary weather information is available in good quality for the 1996–2006 period for two stations located in Puno and Cabanillas (see Fig. 1). Table 2 shows the				

	1	г г	<u> </u>													
			Table 2 Me													,
			Cabanillas		-	ata sou	urce:	Servic	io Na	ciona	al de N	vleteo	rologi	ae Hi	drolog	gra
			del Peru´,	1			100/	200	~							
					n valu		1								_	
				Ja	Fe	М	A	Μ	Ju	Ju	Au	Se	Oc	No	De	Tot
				n	b	ar	pr	ау	n	1	g	pt	t	V	С	al
			Precipita													
			tion													
			(mm)	20	10	12	60	7	2	4	1.4	27	F1	40	00	80
			Puno	20	16	13	60	7	3	4	14	27	51	48	88	80
			Cabanilla	1 16	1 16	8 11	ГС	6	1	3	11	10	54		01	1 73
			Cabanilla s	10 6	10 5	2	56	0	Т	3	11	19	54	55	91	73 8
			Mean	0	5	2										0
			tempera													
			ture													
			(□C)													
			Puno	10.	10.	10.	9.	8.1	6.	6.	7.	9.3	10.	11.	11.	9.5
				8	7	6	7	0.1	8	8	9	5.5	4	0	5	5.15
			Cabanilla	10.	10.	10.	9.	8.6	7.	6.	8.	9.6	10.	11.	11.	9.6
			S	6	5	5	8		3	9	1		6	1	3	
			Minimu													
			m													
			tempera													
			ture													
			(C)													
			Puno	5.7	5.8	5.4	3.	0.8	-	-	0.	1.9	3.6	4.3	5.4	2.9
							8		0.	1.	4					
			Cabanilla	5.3	5.5	5.2	3.	1.1	9	1-	0.	2.1	3.7	4.2	5.1	2.8
				5.5	5.5	5.2	5. 7	1.1	- 0.	- 1.	0. 3	2.1	5.7	4.2	5.1	2.0
			S				<i>'</i>		0. 8	1. 5	5					
									0	5						
Са	ndidate-	To make the	two stations	comr	arabl	e. we	deter	minec	l rela	tive a	noma	alies co	ompar	ed to	the av	/erage
	vel Analysis	precipitation		-												-
		then used to								-			-		-	
		content integ	-							-			-			
		precipitation	records in a	20-da	iy win	dow. 1	This w	/indov	v was	s mov	ed as	a run	ning n	nean b	by step	os of
		one decade (10 days). Thi	is choi	ce is s	uppoi	rted b	y the	calib	ratior	n cam	paign	2003/	2004	descri	- bed
		below. Cover												-		ation
		values for 12					umbe	r of ti	me se	egme	nts st	ill allo	ws for	suffic	cient	
		resolution of	intra-seasor	nal and	omalie	es.										
		[]														
		In conclusion			-	-					- 4 .				h	
		during the re	-	-		-	-			-						
		indicate a sin		-		-				-			-		-	
		variation in t	ne exposure	ubes	not na	ive to	ne co	isiue	eu if	i tile	iuitile			nty an	arysis.	

Household level

Selection of most useful operationalizations (to be completed by expert reviewer)				
Construct Household level				
1 st preference	[Author (year)]			
2 nd preference	[Author (year)]			
3 rd preference	[Author (year)]			

Structured summary of	candidate operationalization	ons
Candidate article: Echev	vin	
Construct operationalize	ed: Household level	
Sub-constructs	Intermediate constructs	
	Directly operationalized	
	constructs	
Conceptual framework	DIRECLY OPERATIONALIZ	ZED
Operationalization of		
sub-constructs		
21. Data collection Operational questions		 The vulnerability and food security survey was conducted in Haiti in October and November 2007 on approximately 3,000 households living in 228 rural communities. This survey has been realized by the National Coordination of Food Security Unit with the partnership of the World Food Program. A community-related component was added to the household component of the survey, in connection with infrastructures and accessibility to basic social services. Table 2 presents summary statistics for variables used in the analysis. Consumption and income are expressed in Gourdes. The agricultural index is a composite indicator which is a linear combination of categorical variables obtained from a multiple correspondence analysis (cf. Asselin, 2009). Variables considered in the analysis are the number of lands, animals
		and agricultural materials owned by the household. [] Table 2. Descriptive statistics Household variables Log of consumption Log of income Agricultural index Income diversity Household size Number of children Age of head Male head Years of schooling (head)

		Activity of head No job Agroalimentary Industry Construction Trade Services Other activity	
Candidate-level Analysis	income. Table 3 presents OLS estir log consumption and log i explanatory variables such characteristics, interaction characteristics, shocks var characteristics, interaction Estimating the two-level l	cks in order to estimate their impact on on mates and GLLAMM estimates. Both moo ncome. Our preferred specification regro n as household characteristics, regional of n between household characteristics and riables, interaction between shocks varia n between shocks variables and commun inear random coefficient model (GLLAMI of the residuals into an idiosyncratic varia	dels are estimated with oups a large set of lummies, community community bles and household ity characteristics. VI) allows us to

Structured summary of c	andidate operationalizatio	ons					
Candidate article: Günther & Harttgen							
Construct operationalized: Household level							
Sub-constructs Intermediate constructs							
	Directly operationalized						
	constructs						
Conceptual framework	DIRECTLY OPERATIONALI	ZED					
Operationalization of							
sub-constructs		1					
22. •	Data collection		household characteristics are taken fro				
			presentative household survey of 2002	· ·			
			Des Me´nages), covering 5,080 househ				
		3,302 rural households) in 186 commu	unities.				
		[]					
		Both surveys do not have any time dimension.					
	Operational questions	Table 1.	Summary statistics for households and	communities			
		Table 1	. Summary statistics for households				
		and co	mmunities				
		Househ	nold characteristics				
		Age of	HH head (years)	-			
		Numbe	er of children				
		Female	headed households (%)				
			nold size Residence (%)	1			
			f schooling of HH head	1			
			in agriculture (HH head) (%)	1			
		-	in informal sector (HH head) (%)	1			
			in formal sector (HH head) (%)	1			
		Works	in public sector (HH head) (%)	1			

	Enterprise owner (%) Land owner (%) Number of cattle
Candidate-level Analysis	To estimate households' expected mean and variance in con- sumption, we first use the household characteristics in Table 1. In addition, we consider an agricultural asset index (composed of eight productive assets) estimated via principal component analysis (Filmer & Pritchett, 2001). [] As described in Section 3, we estimate the expected mean and variance per capita household (log) consumption using multilevel modeling. We also decompose the unexplained con- sumption variance into an idiosyncratic (household-level) and a covariate (community-level) component. The regression results of the multilevel model for the esti- mated mean of (log) consumption are presented in Table 2.

Idiosyncratic shocks

Selection of most useful operationalizations (to be completed by expert reviewer)		
Construct	Idiosyncratic shocks	
1 st preference	[Author (year)]	
2 nd preference	[Author (year)]	
3 rd preference	[Author (year)]	

Str	Structured summary of candidate operationalizations					
Car	Candidate article: Günther & Harttgen					
Сог	Construct operationalized: Idiosyncratic shocks					
Sub	o-constructs	Intermediate constructs				
		Directly operationalized				
		constructs				
Cor	nceptual framework	DIRECTLY OPERATIONALI	ZED			
	erationalization of					
	p-constructs		1			
23.	•	Data collection		household characteristics are taken from the na-		
				presentative household survey of 2001 (Enque [^] te		
			-	Des Me´nages), covering 5,080 households (1,778 ur-		
				3,302 rural households) in 186 communities. The		
				ity census is the 2001 ILO/Cornell Commune Level		
				hich covers 1,385 of the 1,395 communities in Mada-		
			gascar. E	Both surveys do not have any time dimension.		
		Operational questions				
	ndidate-level	The estimated average mean and variance in consumption				
Ana	alysis	for the whole sample are presented in Table 3, also separately for rural and urban				
		households. The expected per capita (log) consumption of rural households is below the				
		(log) poverty line, whereas the expected per capita (log) consumption of ur- ban				
		households lies above the (log) poverty line.				
		With regard to the estimated standard deviation in consumption, we show that the				
		estimated standard deviation is slightly higher for rural households than for urban				
		households, with a standard deviation of 0.58 compared to 0.54 (Table 3). Idiosyn- cratic				
		variance is much higher than covariate variance for ur- ban and only slightly higher for				
		rural households. Hence, the relative importance of idiosyncratic variance is much				
		higher for urban than for rural households. More precisely, whereas among urban				
		households the estimated idiosyncratic standard deviation of consumption is 3.25 times				
		as high as covariate standard deviation, the respective rate is only 1.57 for rural				
		households. As a robustness check, we assume that half of the estimated idiosyncratic				
		variance is measurement error. The idiosyncratic standard deviation is still 2.13 as high				
		as covariate standard deviation for urban households and 1.14 as high for rural				
		households (see Table A.	3).			

Structured summary of candidate operationalizations		
Candidate article: Sarris & Karfakis		
Construct operationalized: Idiosyncratic shocks		
Sub-constructs	Intermediate constructs	

	Directly operationalized				
Concentual from the l					
Conceptual framework	DIRECTLY OPERATIONAL	IZED			
Operationalization of					
sub-constructs	Data collection	The enel		haad	an a nannaantativa
24. •	Data collection	survey o Kilimanja survey o Ruvuma repeated [] The ques socio-ed	ysis of the paper will be f 957 rural households i aro region, in November f 892 rural households i region in February-Mar d a year later stionnaire was designed pnomic characteristics o s on their vulnerability f	n 45 vill r 2003, a n 36 vill ch 2004 l to inve of house	lages done in the and a representative lages done in the I. The survey was estigate the complete sholds with a particular
	Operational questions	Table 2:	Percentage of househo 1999 and 2003, by reg	lds affeo	cted by various shocks
		Agricul Harvest Livesto Post ha Econor Cash cr Cereal Unemp Proper Theft	t ve rains tural production t loss ck loss rvest cereal loss nic op price shock price shock loyment ty use destroyed		
Analysis and the squared resvariable for the vulue crop income per act that it depends pose land, the size of how number of animals household head (signariables. The Durbin-Wu-Haw the hypothesis of expressions for the size of the size of the size of the size of how number of animals household head (signariables.)		s of consul ility analys oncerning t y and signif old, several ed and the ant in Ruvu n test of th neity, so IV imates. W	nstrumental variable) re mption as per equations is is the coefficient in the he consumption per eq ficantly on aggregate cre wealth variables such a lagged value of consum ima), access to credit va e exogeneity of the crop is appropriate. Table 6 e use as instruments a v shock variables, and lagg	s (15) ar ne consu uivalent op prod is the la er dura riables, p produ present variety c	nd (17). The key umption regressions of a dult, it can be seen uctivity, the size of gged value of the bles, the age of the and some education ctivity strongly rejects s the first stage of exogenous land

farm household used fertilizer and chemicals, as well as the lagged number of coffee and cashew trees. The Sargan test does not invalidate the use of these instruments. It must be mentioned that in the consumption regressions the IV regression coefficient of crop income per acre is significantly larger in the IV regressions compared to the OLS estimates (the OLS estimates for these coefficients are 0.028 for Kilimanjaro and 0.174 for Ruvuma, compared to 0.144 and 0.411 for the IV regressions in table 5 for the two regions). The consumption regressions explain about 47 and 51 percent of the variance of consumption in Kilimanjaro and Ruvuma respectively. The regressions of the squared residuals from the consumption regressions (excluding the variables that are related to covariate and idiosyncratic shocks) reveal that fewer of the variables are significant. In Kilimanjaro the dependency ratio, the value of the dwelling, the number of small animals, and the membership in a social group are significant, while in Ruvuma, the only two significant variables are the dummies for whether the household receives remittances and whether the household has easy access to seasonal credit. The regressions explain a the xerage vulnerability index in Kilimanjaro and Ruvuma by district, along with the proportions of the variance of consumption that are due to covariate factors, the average consumption per capita and the average headcount measures of poverty rates in both vears of the survey. The first observation is that

Poverty

Selection of most useful operationalizations (to be completed by expert reviewer)		
Construct Poverty		
1 st preference	[Author (year)]	
2 nd preference	[Author (year)]	
3 rd preference	[Author (year)]	

Structured summary of candidate operationalizations				
Candidate article: Deressa et al				
Construct operationalized: Poverty				
Sub-constructs	Intermediate constructs			
	Directly operationalized			
	constructs			
Conceptual framework DIRECTLY OPERATIONALIZED				
Operationalization of				
sub-constructs				
25. •	Data collection	n/a		
	Operational questions	Using the procedures discussed in Section 3 (applied through the STATA software), we estimate the probability of a household falling below a given level of income (poverty line), and perform a sensitivity analysis by examining this probability using four different minimum levels of income (poverty lines). The choice of minimum levels of income is based on different assumptions such as the international poverty line of 1.25 US per day (World Bank, 2008), average income of the surveyed households and arbitrary values above and below the average income of the surveyed households. The results are plotted in Figures 3 to 6. [] Figure 3. Vulnerability (income at 2 USD per day or 6570 Ethiopian Birr per year) plotted against Ln (income) [] Figure 4. Vulnerability (income at 1.5 USD per day or 4928 Ethiopian Birr per year) plotted against Ln (income) [] Figure 5. Vulnerability (income at 1.25 USD per day or 4471 Ethiopian Birr per year) plotted against Ln (income) [] Figure 6. Vulnerability (income at 0.3 USD per day or 900 Ethiopian Birr per year) plotted against Ln (income)		
Candidate-level	Using the procedures discussed in Section 3 (applied through the STATA software), we			
Analysis	line), and perform a sense minimum levels of incom based on different assum (World Bank, 2008), aver	of a household falling below a given level of income (poverty sitivity analysis by examining this probability using four different ne (poverty lines). The choice of minimum levels of income is nptions such as the international poverty line of 1.25 US per day rage income of the surveyed households and arbitrary values erage income of the surveyed households. The results are		

plotted in Figures 3 to 6.
[]
Figure 3. Vulnerability (income at 2 USD per day or 6570 Ethiopian Birr per year) plotted
against Ln (income)
[]
Figure 4. Vulnerability (income at 1.5 USD per day or 4928 Ethiopian Birr per year)
plotted against Ln (income)
[]
Figure 5. Vulnerability (income at 1.25 USD per day or 4471 Ethiopian Birr per year)
plotted against Ln (income)
[]
Figure 6. Vulnerability (income at 0.3 USD per day or 900 Ethiopian Birr per year) plotted
against Ln (income)

Structured summary of candidate operationalizations						
Car	Candidate article: Mutsvangwa					
Cor	Construct operationalized: Poverty					
Sub	o-constructs	Intermediate constructs				
		Directly operationalized		Cerea	Production	
		constructs				
Cor	nceptual framework	This study uses the household's cereal production levels as a measure of welfare.				
Ope	erationalization of					
sub	-constructs					
26.	Cereal production	Data collection		•	a used in this study was obtained from a	
					ut in September 2009. The survey gathered	
			-		quantitative data pertaining to social,	
			-	•	d economic aspects of the households,	
			-		ities, farmers' perceptions of climate change	
					ocal organizations in helping smallholder	
				-	strategies to mitigate against the negative	
			climate o			
		Operational questions		•	tion/acquisition of cereals, household size and	
			asset ownership was gathered, as summarized in Table 5. This			
			data was gathered using the household questionnaire.			
			Type of	f data	Specific data collected	
			Agricul	ture	Arable land owned; crops grown and	
			produc	tion	areas allocated to the crops; yields	
					obtained; farming implements available;	
					availability of draft power; livestock	
					owned; crop management practices	
Car	ndidate-level	The cleaned data was the	en analyze	d by rur	nning descriptive statistics; mainly	
Ana	alysis	frequencies, descriptive and crosstabs.				
		[]				
		The other analyses carried out involved running the 2 stage least squares regression				
		model using SPSS to find estimates for the vulnerability model. This involved a double				
		regression of the per capita cereal production levels against household observable				
characteristics such as age, gender, education status of the household head, ass						
					vere considered pertinent in influencing cereal	
		production. The estimate	es obtained	d from t	he 2 stage least regression was used to	

measure the degree of each household's vulnerability to food insecurity. The estimated
probability was given by:

Structured summary of	candidate operationalizatio	ons			
Candidate article: Sarris					
Construct operationalized: Poverty					
Sub-constructs	Intermediate constructs				
	Directly operationalized				
	constructs				
Conceptual framework	DIRECTLY OPERATIONAL	ZED			
Operationalization of					
sub-constructs					
27. •	Data collection	The analysis of the paper will be based on a representative survey of 957 rural households in 45 villages done in the Kilimanjaro region, in November 2003, and a representative survey of 892 rural households in 36 villages done in the Ruvuma region in February-March 2004. The survey was repeated a year later [] The questionnaire was designed to investigate the complete socio-economic characteristics of households with a particular emphasis on their vulnerability to a variety of risks.			
	Operational questions	Table 1: General characteristics of rural households in Kilimanjaro and Ruvuma Annual per capita total expenditure Annual per capita total income			
Candidate-level Analysis	and the squared residual variable for the vulnerab crop income per acre. Co that it depends positively land, the size of househod number of animals owner household head (significa variables. The Durbin-Wu-Hausman the hypothesis of exoger regressions for the IV est characteristics, as well as farm household used fer cashew trees. The Sargar It must be mentioned that of crop income per acre estimates (the OLS estim for Ruvuma, compared to regions). The consumption regress consumption in Kilimanja residuals from the consu	Its of the (instrumental variable) regressions on consumption as of consumption as per equations (15) and (17). The key illity analysis is the coefficient in the consumption regressions of oncerning the consumption per equivalent adult, it can be seen y and significantly on aggregate crop productivity, the size of old, several wealth variables such as the lagged value of the ed and the lagged value of consumer durables, the age of the ant in Ruvuma), access to credit variables, and some education in test of the exogeneity of the crop productivity strongly rejects neity, so IV is appropriate. Table 6 presents the first stage timates. We use as instruments a variety of exogenous land is weather shock variables, and lagged dummies for whether the tilizer and chemicals, as well as the lagged number of coffee and in test does not invalidate the use of these instruments. at in the consumption regressions the IV regression coefficient is significantly larger in the IV regressions compared to the OLS ates for these coefficients are 0.028 for Kilimanjaro and 0.174 to 0.144 and 0.411 for the IV regressions in table 5 for the two sions explain about 47 and 51 percent of the variance of aro and Ruvuma respectively. The regressions of the squared mption regressions on the same explanatory variables as the regressions (excluding the variables that are related to			

covariate and idiosyncratic shocks) reveal that fewer of the variables are significant. In
Kilimanjaro the dependency ratio, the value of the dwelling, the number of small
animals, and the membership in a social group are significant, while in Ruvuma, the only
two significant variables are the dummies for whether the household receives
remittances and whether the household has easy access to seasonal credit. The
regressions explain a rather small proportion of the error less than 10 percent in both
regions). This suggests that unexplained components of consumption variability
dominate any parts that maybe due to structural household specific factors.
Tables 7 and 8 indicate the average vulnerability index in Kilimanjaro and Ruvuma by
district, along with the proportions of the variance of consumption that are due to
covariate factors, the average consumption per capita and the average headcount
measures of poverty rates in both years of the survey. The first observation is that
average vulnerability in Kilimanjaro is much lower than in Ruvuma (31 percent versus 60
percent). This is in line with the much larger poverty incidence in Ruvuma compared to
Kilimanjaro that was indicated earlier (63.3 percent versus 39.5 percent).

Sensitivity

Selection of most useful operationalizations (to be completed by expert reviewer)		
Construct Sensitivity		
1 st preference	[Author (year)]	
2 nd preference	[Author (year)]	
3 rd preference	[Author (year)]	

Str	Structured summary of candidate operationalizations		
Са	Candidate article: Antwi-Agyei et al		
Construct operationalized: Sensitivity			
Su	b-constructs	Intermediate constructs	Livelihoods; Livelihood capital assets;
		Directly operationalized	Social capital; financial capital; natural capital;
		constructs	physical capital; human capital
	nceptual framework		
-	erationalization of		
	o-constructs		
3.	Social capital	Data collection	Data presented in this paper were collected using a mixture of participatory methods such as focus group discussions, household questionnaire surveys and key informant interviews. Data collection started with a rapid rural appraisal (Chambers 1994) during which com- munity gatherings and transect walks were conducted with community members including opinion leaders at each of the 6 villages. This provided an overview of the significant social and physical features of the selected communities that influenced their livelihood activities (Sallu et al. 2009). A household questionnaire survey was used to collect both qualitative and quantitative data. The questionnaire survey assessed households' capital assets (financial, human, natural, physical, and social). This information was used to develop a household livelihood vulnerability index (see Sect. 2.3). A total of 270 household ques- tionnaire surveys were conducted in the 6 farming communities (45 Questionnaires in each).
		Operational questions	Social capital—including connections to technical support and social resources such as networks, associations and affiliations—was assessed by counting the number of associations or groups to which the members of the household belong (Pretty and Ward 2001; Vincent 2007). It was assumed that households belonging to a high number of social groups and associations are better networked to cope with the impacts of climate change on their livelihoods activities (Adger 2003; Pretty 2003), as these represent the number of social safety nets and a form of informal grassroots insurance available to the household during climate-related crisis (e.g. Fraser 2007; Vincent 2007). Both bonding and bridging social capital were assessed. Bonding social capital is based on characteristics such as family kinship, ethnicity or nationality (Woolcock 2001). Bridging capital refers to ties to external groups and usually transcends different

			socioeconomic statuses, nationalities, religions, and
			ethnicities (Woolcock 2001). A scoring procedure for social capital followed the methods of Vincent (2007). A score of 1 was given to households that belonged to no identifiable group, 2 for those who were members of one group, 3 for membership of two groups and 4 for membership of more than three groups. While the level of interaction among the group members and the strength of the ties within such social groups could affect their usefulness, interaction and ties were beyond the scope of the assessment and were not considered. [] Table 1 Indicators of household livelihood vulnerability index
			collected through a household survey across six communities in Ghana
			Number of groups or associations households belong to Do you belong to any social groups? Could you please list them?
4.	Financial capital	Data collection	Data presented in this paper were collected using a mixture of participatory methods such as focus group discussions, household questionnaire surveys and key informant interviews. Data collection started with a rapid rural appraisal (Chambers 1994) during which com- munity gatherings and transect walks were conducted with community members including opinion leaders at each of the 6 villages. This provided an overview of the significant social and physical features of the selected communities that influenced their livelihood activities (Sallu et al. 2009). A household questionnaire survey was used to collect both qualitative and quantitative data. The questionnaire survey assessed households' capital assets (financial, human, natural, physical, and social). This information was used to develop a household livelihood vulnerability index (see Sect. 2.3). A total of 270 household ques- tionnaire surveys were conducted in the 6 farming communities (45 Questionnaires in each).
		Operational questions	Eliciting information on financial assets was very problematic because of a lack of records on sales and memory lapses. Livestock were considered to offer readily available cash in times of crop failure due to erratic rainfall patterns in the study communities. [] Households without poultry or livestock scored 1 whilst those with livestock scored 2. In addition, financial assets were assessed by examining the remittances received by the household from family members or friends over the past 12 months. [] Households that received remittances in the last 12 months scored 2 and those that did not receive any remittances scored 1. Access to credit may also influence adaptation to climate change including access to inputs such as improved cultivars of crops (e.g. Butt et al. 2006; Fosu-Mensah et al. 2012). Hence, it is assumed that households that have no

			access to credit will be more vulnerable and scored 1 whilst those with access to credit were given a score of 2. [] Table 1 Indicators of household livelihood vulnerability index collected through a household survey across six communities in Ghana [] Access to credit Do you have access to credit for your agricultural activities? Ownership of livestock Do you have livestock or poultry? List the types and numbers of livestock. Remittances received Have you received remittances from family or friends in the last 12 months?
5.	Natural capital	Data collection	Data presented in this paper were collected using a mixture of participatory methods such as focus group discussions, household questionnaire surveys and key informant interviews. Data collection started with a rapid rural appraisal (Chambers 1994) during which com- munity gatherings and transect walks were conducted with community members including opinion leaders at each of the 6 villages. This provided an overview of the significant social and physical features of the selected communities that influenced their livelihood activities (Sallu et al. 2009). A household questionnaire survey was used to collect both qualitative and quantitative data. The questionnaire survey assessed households' capital assets (financial, human, natural, physical, and social). This information was used to develop a household livelihood vulnerability index (see Sect. 2.3). A total of 270 household ques- tionnaire surveys were conducted in the 6 farming communities (45 Questionnaires in each).
		Operational questions	Natural capital assets were assessed by two indicators. The first was the size of the farm holding under cultivation (this was estimated as the average area of cultivated land over the past 5 years) (Table 1). It is assumed that the larger the farm holding, the greater the opportunity for the household to have more crops and yield, and hence the lower the vulnerability to climate change, though it is noted that labour availability and financial capital both affect the reality of how much land can be cultivated. Households which cultivated less than 5 acres scored 1; those cultivating between 5 and 10 acres scored 2; those cultivating between 11 and 15 acres scored 3; those cultivating 16-20 acres scored 4, and households cultivating [20 acres scored 5. The type of land tenure and level of security it provides may have serious implications for the management of agricultural soils and could indirectly affect crop productivity and environmental sustainability, conse- quently influencing household vulnerability (Butt et al. 2006). Three different tenure arrangements were identified in the study communities. These were "land inherited", "land purchased" and "land rented" by the household. A score of 1 was given to

			households who rented their farmlands; 2 for households who purchased their farmlands; and 3 for those who inherited their farmlands. Households that inherited their farm lands were given the highest score because it is assumed that they will have the most secure land tenure. [] Table 1 Indicators of household livelihood vulnerability index collected through a household survey across six communities in Ghana [] Farm holding size Could you please state the size of farm holding in acres? Tenure system By what arrangements do you have access to your farm land for farming activities?
6.	Physical capital	Data collection	Data presented in this paper were collected using a mixture of participatory methods such as focus group discussions, household questionnaire surveys and key informant interviews. Data collection started with a rapid rural appraisal (Chambers 1994) during which com- munity gatherings and transect walks were conducted with community members including opinion leaders at each of the 6 villages. This provided an overview of the significant social and physical features of the selected communities that influenced their livelihood activities (Sallu et al. 2009). A household questionnaire survey was used to collect both qualitative and quantitative data. The questionnaire survey assessed households' capital assets (financial, human, natural, physical, and social). This information was used to develop a household livelihood vulnerability index (see Sect. 2.3). A total of 270 household ques- tionnaire surveys were conducted in the 6 farming communities (45 Questionnaires in each).
		Operational questions	Physical assets that were assessed included the presence of irrigation facilities and own- ership of radios, television or mobile phones by a household (Table 1). Irrigation facilities are crucial for rain-fed agriculture-dependent households, as these facilities help farmers to practise dry season farming. It is assumed that households with irrigation facilities will be less vulnerable to changing rainfall patterns. Hence, households without irrigation facilities scored 1, whilst those with these facilities scored 2. The presence of radios, television or mobile phone in a rural household can be an effective tool for communication and accessing information on changing weather patterns (see Naab and Koranteng 2012). Here, households with any of these three assets scored 2, and those without any scored 1. Physical assets such as road networks and the availability of markets and health facilities may enhance the adaptive capacity of a household (see Zhang et al. 2007). These assets were not included in the vulnerability computation because field observations suggested that these physical assets did not significantly differ amongst either the resilient or vul- nerable communities. []

			Irrigation facilities
			Irrigation facilities Do you have access to irrigation facilities for dry season farming? Ownership of radio, television or mobile phone Could you please list all communication gadgets that you have? These include TV, mobile phone or radios etc.
7.	Human capital	Data collection	Data presented in this paper were collected using a mixture of participatory methods such as focus group discussions, household questionnaire surveys and key informant interviews. Data collection started with a rapid rural appraisal (Chambers 1994) during which com- munity gatherings and transect walks were conducted with community members including opinion leaders at each of the 6 villages. This provided an overview of the significant social and physical features of the selected communities that influenced their livelihood activities (Sallu et al. 2009). A household questionnaire survey was used to collect both qualitative and quantitative data. The questionnaire survey assessed households' capital assets (financial, human, natural, physical, and social). This information was used to develop a household livelihood vulnerability index (see Sect. 2.3). A total of 270 household ques- tionnaire surveys were conducted in the 6 farming communities (45 Questionnaires in each).
		Operational questions	Human capital assets were represented by two indicators: the educational level of the head of the household (or the most educated person in the household) and the health status of the household (Table 1). No formal education was afforded a value of 1; 2 in the case of only primary education; 3 in the case of secondary education; and 4 for households that had tertiary education. [] To assess health status, households were asked about the number of times they have been to the hospital (or hospitalised) within the last 12 months. House- holds with members that had been to the hospital were scored 1 whilst those with members that had not been to hospital as out patients (and those not needing any medical attention) within this period were scored 2. Also, situations where members of a household required hospital treatment but could not arrange transport and other resources needed were taken into consideration when scoring such a household. [] Table 1 Indicators of household livelihood vulnerability index collected through a household survey across six communities in Ghana [] Educational level Could you please state the highest education attained? Health status Have any member of this household been ill in the last 12
Car	didate-level	To ensure the comparabil	months?
Cal	Candidate-level To ensure the comparability of indicators that were used in the construction of the		

Analysis	household livelihood vulnerability index, all indicators were standardised following the
	UNDP (2007) procedure of standardising indicators for life expectancy index (Eq. 1).
	[]
	Having standardised the indicators, it was then necessary to elicit appropriate weights to
	them. An unequal weighting system, based on relative importance attached to each indi-
	cator by local households, extension officers, key informants and experts was used
	because it was deemed necessary to include the views of both local households and experts in the assessment. Hence, a five-point Likert scale was used where farmers,
	extension officers, key informants, and experts were asked to rank the five most
	important indicators that they considered to influence vulnerability at the household
	level (Table 2). The number of times a particular indicator was cited was used to
	generate the weighting system (Table 2). The following weights were assigned: 14 % to
	social capital, 11 % to human capital, 9 % to natural capital, 27 % to financial capital, 10
	% to physical capital and 29 % to livelihood diversification (Table 2). The household
	livelihood vulnerability index for a household was then calculated using the following
	model (Eq. 2) (Vincent 2004).
	HLVI ¼ Ssvi 🗆 Wi
	ðÞþðHsvi□WiiÞþ ðNsvi□WiiiÞþðFsvi□WivÞþðPsvi□WvÞ þðLsvi□WviÞ
	Quanti- tative data were transcribed and analysed using SPSS and Minitab (Edition 15).
	Using Minitab, a one-way ANOVA was computed to compare the relative vulnerability
	among the various households and communities, and all differences resulting in $p\setminus 0.05$
	were considered statistically significant. K-means cluster analysis using STATISTICA
	software was undertaken to group the households according to their vulnerability. K-
	means cluster analysis, which seeks to group cases into distinct clusters by seeking
	groups that minimise variability within clusters and maximise variability between
	clusters (Levia and Page 2000), has been applied to spatial vulnerability assessment in
	dynamic systems (see Antwi- Agyei et al. 2012).

Structured summary of candida	Structured summary of candidate operationalizations				
Candidate article: Hahn et al					
Construct operationalized: Sens	sitivity				
Sub-constructs	Intermediate cons	structs	Food; health; water		
	Directly operationalized constructs		Food from family farm; struggle for food; crop diversity; dont save crops; dont save seeds; Fam with chronic illness; proximity to health facility; weeks illness; malaria exposure-prevention; Water conflict; natural water source; proximity to water source; inconsistent water supply; inverse water stored		
Conceptual framework		sensitivity is measured by assessing the current state of a district's food and water security and health status.			
Operationalization of sub- constructs					
28 Food from family farm	Data collection	househ	old surveys		
	Operational questionsTable 1 includes an explanation of how each sub- component was quantified, the survey question used collect the data, the original source of the survey que and potential sources of bias.		nent was quantified, the survey question used to the data, the original source of the survey question,		

		[]		
		comprising the Liv	nponents and sub-co velihood Vulnerabilit o districts of Mozam	ty Index (LVI)
		Sub-components	Explanation of	Survey question
			sub-components	
		Percent of	Percentage of	Where does
		households	households that	your family get
		dependent on family farm for	get their food primarily from	most of its food?
		food	their personal	
			farms.	
29 struggle for food	Data collection	household surveys		
	Operational		explanation of how	
	questions		antified, the survey	
			-	he survey question,
		and potential sourc	.es ui nig2.	
		[]		
		Table 1 Major cor	nponents and sub-co	omponents
			elihood Vulnerabilit	
			o districts of Mozam	
		Sub-components	Explanation of sub-components	Survey question
		Average	Average	Does your family
		number of	number of	have adequate
		months households	months	food the whole
		struggle to find	households struggle to	year, or are there times during the
		food (range: 0–	obtain food for	year that your
		12)	their family.	family does not
		,	,	, have enough
				food?
				Howmanymonths
				a year does your
				family have trouble getting
				enough food?
30 crop diversity	Data collection	household surveys	·	
	Operational		explanation of how	each sub-
	questions		antified, the survey	-
			-	he survey question,
		and potential sourc	ces of dias.	
		[]		
		Table 1 Major cor	nponents and sub-co	omponents
		-	velihood Vulnerabilit	
			o districts of Mozam	
		Sub-components	Explanation of	Survey question
			sub-components	M/bat kind of
		Average Crop	The inverse of	What kind of

			Diversity Index (range: >0–1)a	(the number of crops grown by a household +1). e.g., A household that grows pumpkin, maize, nhemba beans, and	crops does your household grow?
				cassava will have	
31	dant anus avans	Data collection	household surveys	a Crop Diversity	
51	dont save crops	Operational questions	Table 1 includes an component was qua collect the data, the and potential sourc []	antified, the survey of original source of t	question used to he survey question,
			comprising the Liv	elihood Vulnerabilit	y Index (LVI)
			Sub-components	districts of Mozaml Explanation of sub-components	Survey question
			Percent of households that do not save crops	Percentage of households that do not save crops from each harvest.	Does your family save some of the crops you harvest to eat during a different time of year?
		Data collection Operational questions	household surveys Table 1 includes an component was qua collect the data, the and potential sourc []	antified, the survey of original source of t	question used to
	dont save seeds		comprising the Liv	ponents and sub-co elihood Vulnerabilit districts of Mozaml <i>Explanation of</i>	y Index (LVI)
			Percent of households that do not save seeds	sub-components Percentage of households that do not have seeds from year to year.	Does your family save seeds to grow the next year?
	Family with chronic illness	Data collection Operational		•	·
	proximity to health facility	questions Data collection Operational	household surveys Table 1 includes an	•	
		questions	component was qua	antified, the survey	question used to

			and potential source [] Table 1 Major com comprising the Liv	es of bias. ponents and sub-co elihood Vulnerabilit	y Index (LVI)
			developed for two Sub-components	districts of Mozam Explanation of	bique. Survey question
			Average time to health facility (minutes)	sub-components Average time it takes the households to get to the nearest health facility.	Howlong does it take you to get to a health facility?
		Data collection	household surveys		
		Operational questions	Table 1 includes an component was qua	ntified, the survey original source of t	
	2 weeks illness		Table 1 Major components and sub-components comprising the Livelihood Vulnerability Index (LVI) developed for two districts of Mozambique.		
	2 weeks miless		Sub-components	Explanation of sub-components	Survey question
			Percent of	Percentage of	Has anyone in
			households	households that	your family been
			where a family	report at least 1	so sick in the
			member had to	family member	past 2 weeks
			miss work or	who had to miss	that they had to
			school in the last	school of work	miss work or
			2 weeks due to	due to illness in	school?
		Data collection	illness household surveys	the last 2 weeks.	
		Operational		explanation of how	each sub-
		questions	Table 1 includes an explanation of how each sub- component was quantified, the survey question used to collect the data, the original source of the survey quest and potential sources of bias. []		
			Table 1 Major com	ponents and sub-co	omponents
	malaria exposure-prevention		-	elihood Vulnerabilit	
				districts of Mozam	
			Sub-components	Explanation o	-
				sub-compone	
			Average Malaria	Months	Which
			Exposure*Prevent Index (range: 0–12		months of the year is
				malaria*Own	-

			hadnat indicate	
			bednet indicato	
			(have bednet =	,
			0.5, no bednet	
			1) (e.g.,	nets do you
			Respondent	have?
			reported	
			malaria is a	
			problem	
			January–March	1
			and they do no	
			own a bednet =	
			3*1 = 3).	
	Data collection	household surveys		
	Operational	Table 1 includes an	explanation of how e	ach sub-
	questions	component was qua	antified, the survey qu	uestion used to
			original source of th	
		and potential source	-	, , - ,
		[]		
		[]		
		Table 1 Major components and sub-components comprising the Livelihood Vulnerability Index (LV developed for two districts of Mozambique.		nponents
Water conflict				
		Sub-components		Survey question
		,	sub-components	, ,
		Percent of		In the past year,
		households	-	have you heard
		reporting water		about any
		conflicts		conflicts over
		connects		water in your
				-
			community.	community?
	Data collection	household surveys	connuncy.	
	Operational	-	explanation of how e	ach sub-
	questions		antified, the survey qu	
	-1,		original source of th	
		and potential source	-	
		[]		
		-	ponents and sub-cor	•
		comprising the Liv	elihood Vulnerability	Index (LVI)
natural water source		developed for two	districts of Mozambi	que.
natulal water soulce		Sub-components	Explanation of	Survey question
			sub-components	-
		Percent of	•	Where do you
		households that		collect your
		utilize a natural		water from?
		water source	river, lake, pool,	
			or hole as their	
			primary water	
			source.	

	Operational	Table 1 includes an	ovaloantion of how	aach cub
	Operational questions	Table 1 includes an component was qua		
	questions	collect the data, the	-	
		and potential sourc		ne sulvey question,
		[]		
		[]		
		Table 1 Major com	ponents and sub-co	omponents
		comprising the Liv	elihood Vulnerabilit	y Index (LVI)
		developed for two	districts of Mozaml	pique.
		Sub-components	Explanation of	Survey question
			sub-components	
		Average time to	Average time it	How long does it
		water source	takes the	take to get to
		(minutes)	households to	your water
			travel to their	source?
			primary water	
	Data sall il		source.	
	Data collection	household surveys	en la matter d'h	
	Operational	Table 1 includes an component was qua	•	
	questions	collect the data, the		•
		and potential sourc	-	ne survey question,
		[]		
		Table 1 Major com	ponents and sub-co	omnonents
			elihood Vulnerabilit	
inconsistent water supply			districts of Mozaml	
		Sub-components	Explanation of	Survey question
		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	sub-components	
		Percent of	Percentage of	Is this water
		households that	households that	available
		do not have a	report that	everyday?
		consistent water	water is not	
		supply	available at their	
			primary water	
			source everyday	
	Data collection	household surveys		
	Operational	Table 1 includes an	-	
	questions	component was qua	-	
		collect the data, the		he survey question,
		and potential sourc	es of bias.	
		[]		
		Table 1 Main		
inverse water stored			ponents and sub-co	
			elihood Vulnerabilit	
		-	districts of Mozaml	-
		Sub-components	sub-components	Survey question
		Inverse of the	The inverse of	What containers
		average number	(the average	do you usually
		of liters of water	number of liters	store water in?
		stored per	of water stored	How many?
	L		Si water stored	now many:

		household	by each	How many liters
		(range: >0-1)	household + 1).	are they?
Candidate-level Analysis	Rather than merge the	ne major componen	ts into the LVI in one	e step, they are first
	combined according	to the categorizatio	n scheme in Table 2	using the following
	equation:			
	$CF_d = \left[\sum_{i=1}^{n} w_{Mj} M_{di}\right]$	$\left[\sum_{i=1}^{n} w_{Mi}\right]$		
	where CFd is an IPC	C-defined contribu	ting factor (exposu	re, sensitivity, or
	adaptive capacity) f			
	indexed by i, wMi is	the weight of each	major component,	and n is the
	number of major co	mponents in each c	contributing factor.	

Str	Structured summary of candidate operationalizations							
Car	Candidate article: Piya et al							
Construct operationalized: Sensitivity								
Sub	o-constructs	Intermediate con	structs					
		Directly operatio	nalized					
		constructs						
	nceptual	DIRECTLY OPERA	TIONALIZED					
	mework							
•	erationalization							
	sub-constructs		T					
32.	•	Data collection	-	based on the primary data collected by household survey				
			conducted in					
			-	The first phase of household survey was conducted in				
				arch 2010 and the second phase in May-June 2011.				
		Operational	3.2.2 Sensitivity					
		questions	Sensitivity is given by the degree to which a system is modified or affected by an internal or external disturbance or set of disturbances (Gallopin,					
			2003). Liveli	hood impacts of climate related disasters were taken as the				
			sensitivity in	dicator following Daze, Ambrose, & Ehrhart (2009) and				
			Marshall et a	al. (2009). Deaths of family members and loss of properties				
			(viz. land, liv	estock, and crop) due to climate related disasters over the last				
			ten years re	present the sensitivity for the purpose of this study. It is				
			hypothesize	d that higher impacts of past climatic hazards will increase the				
			sensitivity of	the households to such events. The income structure will also				
			determine tl	ne household sensitivity. Higher share of natural resource				
			based incom	e (composed of agriculture, livestock, forest, honey and				
				will increase the sensitivity of the household as these sources				
			-	pendent on climate; while higher share of non-natural				
				sed remunerative income sources (composed of salaried jobs,				
				illed jobs, and remittances from abroad) will reduce the				
				hese three income sources are categorized as remunerative				
				ause the return from these sources is comparatively higher				
				ources of income. It was found that the annual income of the				
	households having any of these three sources is higher control households with no income from any of these three sour							
				Joshi, 2011b). The detailed breakdown of the share of various				
			-	ces are given in Appendix 2.				
				cators for sensitivity				

			Component Indicators	Description of the Indicators	Unit	Hypothesized relation
			Fatalities	Death of family members	Number	+
			ratantics	due to climate related	of family	
				disasters (floods, landslides)	members	
				over the last 10 years	members	
			Damage to	Total land damaged by	Area in	+
			properties	flood/landslides over the last	local	
				10 years	units	
					(Kattha4)	
				Total livestock death due to	Livestock	+
				flood/landslides/drought/hail	Standard	
				over the last 10 years	Unit	
					(LSU5)	
				Total crop damage due to	Value in	+
				flood/ landslides/ drought/	Nepali	
				hail over the last 10 years	Rupees	
					(NRs6)	
			Income	Share of natural resource	%	+
			structure	based income (agriculture,		
				livestock, forest, honey, and		
				handicraft) to total income		
				Share of non-natural based	%	-
				remunerative income		
				(salaried job, remittance,		
				skilled non-farm job) to total		
				income		
			in standard un = 1 LSU, 1 imm LSU, 1 pig = 0. (CBS, 2003; Ba 6 73 NRs = 1 U	gates of different types of livesto it calculated using the following nature buffalo = 0.5 LSU, 1 Cow = 3 LSU, 1 sheep or goat = 0.2 LSU ral, 2005). IS \$ at the time of field survey.	equivalents; 0.8 LSU, 1 c and 1 poultr	1 adult buffalo alf = 0.4 y = 0.1 LSU
	ndidate-level	-		tors, now these need to be norn		-
Ana	alysis			n the comparable range (Nelson, rmalization is done by subtractin		
		• • •		he standard deviation for each in	-	from the
				Value / Mean s <i>t</i> andard devia		
				to these indicators.		
		[]				
		The normalized va	ariables are the	n multiplied with the assigned w	eights to cor	struct the
		indices (for expos	ure, sensitivity,	and adaptive capacity separately	y) using the f	ollowing
		formulae:				
		$Ij = \sum_{i=1}^{k} b_i [(a_{ji} - x_{ij})]$				
			-	value, 'b' is the loadings from fire	-	
				ective indicators, 'a' is the indicat		
				dard deviation of the indicators.	-	-
		tor each househo	d is calculated a	as: $V = E + S - AC$, where, V is the	vulnerabilit	y index, E the

exposure index, S is the sensitivity index and AC is the adaptive capacity index for respective
household.

Str	uctured summary of c	andidate operationalizati	ons
	ndidate article: Sietz e		
Со	nstruct operationalize	d: Sensitivity	
Sub	o-constructs	Intermediate constructs	
		Directly operationalized	
		constructs	
Сог	nceptual framework	DIRECTLY OPERATIONAL	IZED
Ор	erationalization of		
sub	p-constructs		
33.	•	Data collection	The ALTAGRO (2006) data base contains detailed quantitative information for 527 smallholder households collected through household questionnaires.
		Operational questions	Ten categories describe the smallholder households covering personal information about the family members (e.g. occupation, education level, age), production systems (e.g. crop and livestock assets, labour input, processing and commer- cialisation of produce), weather conditions, food reserves, income, some expenses and credits. [] The following data are taken from the ALTAGRO (2006) data base to indicate the mechanisms relevant in this study. As the first dimension, the harvest failure risk is indicated by the number of production zones used for crop and pasture cultivation. The indicator considers plains, hillsides and hills. The second dimension of the area con- straint is measured by the crop area as an important pre- requisite for food production. The pasture area highly correlates to livestock keeping and is therefore reflected in the livestock measure. The third dimension, the livestock constraint, is characterised by the number and types of animals. To compare various animal species, we calculated standardised livestock units in relation to an improved cattle variety based on the livestock-specific metabolism (Kleiber 1961). Average livestock weights were estimated using 20 representative animals of each species in the study region. Since fodder production is an essential condition for livestock keeping, the respective indicator contains a reference to the area and productivity of pasture land. Furthermore, the productivity constraint as the fourth dimension is provided for the major food crops potatoes and quinua. It averages the household's productivity across species, varieties and production zones for each crop. Again, we concentrate on food crops since the productivity of pastures is already included in the livestock measure. The fifth dimension of education deprivation relates to the number of years that a household head attended school. School attendance is classified according to the four levels: no formal education, primary, secondary and higher edu- cation. Finally, the lack of

		sum of annual mou and remittances. P household 495 members who mig example mining ar indicators used to [] Table 1 Indicators	netary income from People usually recein grate for climate-ind nd commerce. Table assess vulnerability s of households' se	asion is quantified by the n local off-farm activities we remittances from dependent labour, for e 1 summarises the /. nsitivity and adaptive livestock constraints
		as well as lack of winsorisation, se ALTAGRO 2006)	-	is provided following
		Dimension of sensitivity and adaptive capacity	Indicator	Range
		Harvest failure risk	Number of production zones used for cultivation	1–3
		Area constraint	Crop area	0.1–1.3 ha/person ^a
		Livestock constraint	Livestock units	0.1–8.0 livestock units/person
		Productivity constraint	Potato productivity Quinua productivity	0.1–10.0 t/ha 0.2–1.8 t/ha
		Education deprivation	Education level of household head	1-4
		Lack of alternative income	Local off-farm income and remittances	0–2400 Soles/year*person
		a Average: 4 pers	sons per household	
Candidate-level Analysis In preparing the further analysis, we adjusted data sets with only a few extreme value to increase the influence of these data sets on the cluster partitions. For example, the majority of households possess eight or fewer units of livestock. The few households with up to 39 livestock units can be formally interpreted as single outliers which skew the overall data distribution of this indicator. To deskew such data sets and thus adequately focus on the majority of households, we winsorised the data sets, i.e., replaced the outlying observations (4%) with the next available less extreme observat (Barnett and Lewis 1994). This pro- cedure was applied to the area and livestock constraints as well as the alternative income. All indicators were then normalised to a 1 range using the minimum–maximum values. Prior to the cluster analysis, we determined correlations between the selected indicators and the variance distribu- tion in the data space. Firs the correlation coefficients reached average absolute values of 0.11. The crop area an				ions. For example, the The few households e outliers which skew ata sets and thus the data sets, i.e., less extreme observation rea and livestock e then normalised to a 0–

livestock units correlate most strongly here (0.46) reflec- ting the mixed production systems. Furthermore, variables showing a large variance may be intuitively expected to
contain most of the structure information. Therefore, we explored the variance of the
selected indicators using a principal component analysis (PCA). The PCA was per- formed
using the open source statistics package R (RDCT 2009) following standard procedure
based on Pearson correlations.

Vulnerability (IPCC)

Selection of most useful operationalizations (to be completed by expert reviewer)			
Construct Vulnerability (IPCC)			
1 st preference	[Author (year)]		
2 nd preference	[Author (year)]		
3 rd preference	[Author (year)]		

An explanatory note: In this section, many operationalizations are built on constructs that are dealt with elsewhere in this document. When choosing among candidates here, the choice is effectively between choosing between a Vulnerability IPCC framework that is operationalized in a specific way here, or one that is operationalized using constructs for which themselves there are multiple candidate operationalizations. This section is therefore best completed after choices have been made for the sub-constructs, and when making a choice here, consider your first preference from those sub-constructs.

Str	Structured summary of candidate operationalizations			
Ca	Candidate article: Antwi-Agyei et al			
Со	nstruct operationalize	d: Vulnerability (IPCC)		
Sub-constructs		Intermediate constructs Directly operationalized constructs	Sensitivity; Livelihoods; Livelihood capital assets diversified livelihood activities; exposure-SEE CANDIDATE SECTION; Social capital; financial	
			capital; natural capital; physical capital; human capital	
Со	nceptual framework			
-	erationalization of o-constructs			
34.	diversified livelihood activities	Data collection	Data presented in this paper were collected using a mixtur participatory methods such as focus group discussions, household questionnaire surveys and key informant interviews. Data collection started with a rapid rural appra (Chambers 1994) during which com- munity gatherings and transect walks were conducted with community members including opinion leaders at each of the 6 villages. This provided an overview of the significant social and physical features of the selected communities that influenced their livelihood activities (Sallu et al. 2009). A household questionnaire survey was used to collect both qualitative a quantitative data. The questionnaire survey assessed households' capital assets (financial, human, natural, physi and social). This information was used to develop a househ livelihood vulnerability index (see Sect. 2.3). A total of 270 household ques- tionnaire surveys were conducted in the 0 farming communities (45 Questionnaires in each).	
	exam com		In addition to exploring the five capital assets, this study also examined whether house- holds in resilient and vulnerable communities diversified their livelihood activities. This is important because diversification has been reported as one of	

			the main strategies for reducing household vulnerability to the impacts of climate change and variability (see Ellis 1998; Barrett et al. 2001). Therefore, the number of livelihood activities that a household was engaged in was also assessed. [] A score of 1 was therefore given to households that had only one livelihood activity, 2 for households having two livelihood activities, 3 for those with three livelihood activities, 4 for those with four livelihood activities, and households with[4 livelihood activities scored 5. [] Table 1 Indicators of household livelihood vulnerability index collected through a household survey across six communities in Ghana []
			Livelihood diversity index What are your main livelihood activities? Could you rank these in terms of their contribution to household income?
35.	Exposure	Data collection	-SEE CANDIDATE SECTION
26		Operational questions	Naturlid/faasibla
36.	Social capital	Data collection Operational questions	Not valid/feasible
		Data collection	Same as 'diversified livelihood activites'
	financial capital	Operational questions	Eliciting information on financial assets was very problematic because of a lack of records on sales and memory lapses. Livestock were considered to offer readily available cash in times of crop failure due to erratic rainfall patterns in the study communities. [] Households without poultry or livestock scored 1 whilst those with livestock scored 2. In addition, financial assets were assessed by examining the remittances received by the household from family members or friends over the past 12 months. [] Households that received remittances in the last 12 months scored 2 and those that did not receive any remittances scored 1. Access to credit may also influence adaptation to climate change including access to inputs such as improved cultivars of crops (e.g. Butt et al. 2006; Fosu-Mensah et al. 2012). Hence, it is assumed that households that have no access to credit will be more vulnerable and scored 1 whilst those with access to credit were given a score of 2. [] Table 1 Indicators of household livelihood vulnerability index
			collected through a household survey across six communities in Ghana [] Access to credit Do you have access to credit for your agricultural activities? Ownership of livestock Do you have livestock or poultry? List the types and numbers

		of livesteel.
		of livestock.
		Remittances received Have you received remittances from family or friends in the
		last 12 months?
	Data collection	Same as 'diversified livelihood activites'
natural capital	Operational questions	Natural capital assets were assessed by two indicators. The first was the size of the farm holding under cultivation (this was estimated as the average area of cultivated land over the past 5 years) (Table 1). It is assumed that the larger the farm holding, the greater the opportunity for the household to have more crops and yield, and hence the lower the vulnerability to climate change, though it is noted that labour availability and financial capital both affect the reality of how much land can be cultivated. Households which cultivated less than 5 acres scored 1; those cultivating between 5 and 10 acres scored 2; those cultivating between 11 and 15 acres scored 3; those cultivating 16-20 acres scored 4, and households cultivating [20 acres scored 5. The type of land tenure and level of security it provides may have serious implications for the management of agricultural soils and could indirectly affect crop productivity and environmental sustainability (Butt et al. 2006). Three different tenure arrangements were identified in the study communities. These were "land inherited", "land purchased" and "land rented" by the household. A score of 1 was given to households who rented their farmlands; 2 for households who purchased their farmlands; and 3 for those who inherited their farmlands. Households that inherited their farm lands were given the highest score because it is assumed that they
		 will have the most secure land tenure. [] Table 1 Indicators of household livelihood vulnerability index collected through a household survey across six communities in Ghana [] Farm holding size Could you please state the size of farm holding in acres? Tenure system By what arrangements do you have access to your farm land for farming activities?
	Data collection	Same as 'diversified livelihood activites'
physical capital	Operational questions	Physical assets that were assessed included the presence of irrigation facilities and own- ership of radios, television or mobile phones by a household (Table 1). Irrigation facilities are crucial for rain-fed agriculture-dependent households, as these facilities help farmers to practise dry season farming. It is assumed that households with irrigation facilities will be less vulnerable to changing rainfall patterns. Hence, households without irrigation facilities scored 1, whilst those with these facilities scored 2. The presence of radios, television or mobile phone in a rural household can be an effective tool for communication and accessing information

		on changing weather patterns (see Naab and Koranteng 2012). Here, households with any of these three assets scored 2, and those without any scored 1. Physical assets such as road networks and the availability of markets and health facilities may enhance the adaptive capacity of a household (see Zhang et al. 2007). These assets were not included in the vulnerability computation because field observations suggested that these physical assets did not significantly differ amongst either the resilient or vul- nerable communities. [] Irrigation facilities Do you have access to irrigation facilities for dry season farming? Ownership of radio, television or mobile phone Could you please list all communication gadgets that you have? These include TV, mobile phone or radios etc.
human capital	Data collection Operational questions	Same as 'diversified livelihood activites' Human capital assets were represented by two indicators: the educational level of the head of the household (or the most educated person in the household) and the health status of the household (Table 1). No formal education was afforded a value of 1; 2 in the case of only primary education; 3 in the case of secondary education; and 4 for households that had tertiary education. [] To assess health status, households were asked about the number of times they have been to the hospital (or hospitalised) within the last 12 months. House- holds with members that had been to the hospital were scored 1 whilst those with members that had not been to hospital as out patients (and those not needing any medical attention) within this period were scored 2. Also, situations where members of a household required hospital treatment but could not arrange transport and other resources needed were taken into consideration when scoring such a household. [] Table 1 Indicators of household livelihood vulnerability index collected through a household survey across six communities in Ghana [] Educational level Could you please state the highest education attained? Health status Have any member of this household been ill in the last 12 months?
Candidate-levelTo ensure the comparability of indicators that were used in the construction of the household livelihood vulnerability index, all indicators were standardised following th UNDP (2007) procedure of standardising indicators for life expectancy index (Eq. 1). [] Having standardised the indicators, it was then necessary to elicit appropriate weights them. An unequal weighting system, based on relative importance attached to each in cator by local households, extension officers, key informants and experts was used		

because it was deemed necessary to include the views of both local households and
experts in the assessment. Hence, a five-point Likert scale was used where farmers,
extension officers, key informants, and experts were asked to rank the five most
important indicators that they considered to influence vulnerability at the household
level (Table 2). The number of times a particular indicator was cited was used to
generate the weighting system (Table 2). The following weights were assigned: 14 % to
social capital, 11 % to human capital, 9 % to natural capital, 27 % to financial capital, 10
% to physical capital and 29 % to livelihood diversification (Table 2). The household
livelihood vulnerability index for a household was then calculated using the following
model (Eq. 2) (Vincent 2004).
HLVI ¼ Ssvi 🗆 Wi
ðÞþðHsvi□WiiÞþ ðNsvi□WiiiÞþðFsvi□WivÞþðPsvi□WvÞ þðLsvi□WviÞ
[]
Quanti- tative data were transcribed and analysed using SPSS and Minitab (Edition 15).
Using Minitab, a one-way ANOVA was computed to compare the relative vulnerability
among the various households and communities, and all differences resulting in p\0.05
were considered statistically significant. K-means cluster analysis using STATISTICA
software was undertaken to group the households according to their vulnerability. K-
means cluster analysis, which seeks to group cases into distinct clusters by seeking
groups that minimise variability within clusters and maximise variability between
clusters (Levia and Page 2000), has been applied to spatial vulnerability assessment in
dynamic systems (see Antwi- Agyei et al. 2012).

Stru	uctured summary of o	candidate operationalizatio	ons	
Car	ididate article: Baca e	et al		
Cor	nstruct operationalize	d: Vulnerability (IPCC)		
Sub-constructs		Intermediate constructs		Exposure-SEE CANDIDATE SECTION; sensitivity-SEE CANDIDATE SECTION; adaptive capacity-SEE CANDIDATE SECTION'
		Directly operationalized		
		constructs		
Cor	nceptual framework	The vulnerability in the factors: exposure, sens		Is of small coffee farmers is a function of three d adaptive capacity.
•	erationalization of -constructs			
37.	 Exposure 	Data collection	SEE CAN	DIDATE SECTION'
		Operational questions		
38.	 Sensitivity 	Data collection	SEE CAN	DIDATE SECTION'
		Operational questions		
39.	Adaptive	Data collection	SEE CAN	DIDATE SECTION'
	capacity	Operational questions		
40.	•	Data collection		
		Operational questions		
	ndidate-level alysis	For exposure, the relative decreases in climatic suitability according to the MAXENT model were divided into three classes of suitability loss (low, medium, high). For sensitivity and adaptive capacity, indicators were identified and quantified through		
		interviews with the farming families. []		
		Each factor (exposure, sensitivity and adaptive capacity), as previously explained, and was classified into three levels (high, medium, low). To calculate the vulnerability equation we assigned each level a quantitative value: low=1, medium=2, high=3. With		

three factors and three levels per factor, we obtained 27 possible combinations. After applying the equation we obtained 7 values $(-1,0,1,2,3,4,5)$, which we used to define low $(-1,0)$, medium $(1,2,3)$ and high $(4,5)$ levels of vulnerability (Figure 1). A Principal Components Analysis (PCA) was carried out to identify the indicators that most
contribute to the sensitivity or adaptive capacity of families in different municipalities.

Structured summary of	andidate operationalizati	ons	
Candidate article: CARE	(2009)		
Construct operationalize	d: Vulnerability (IPCC)		
Sub-constructs	Intermediate constructs		
	Directly operationalized	Adaptive capacity- SEE CANDIDATE SECTION	
	constructs		
Conceptual framework	Vulnerability to climate change has been defined as: The degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate variation to which a system is exposed, its sensitivity, and its adaptive capacity.5		
Operationalization of			
sub-constructs			
41. • Adaptive	Data collection	SEE CANDIDATE SECTION	
capacity	Operational questions		
Candidate-level			
Analysis			

Str	Structured summary of candidate operationalizations				
Ca	ndidate article: Eakin	et al (2012)			
Со	nstruct operationalize	ed: Vulnerability (IPCC)			
Sul	b-constructs	Intermediate constructs		Adaptiveness	
		Directly operationalized		Adaptation strategy- SEE CANDIDATE SECTION	
		constructs			
Со	nceptual framework				
Ор	erationalization of				
sub	p-constructs				
42.	. Adaptation	Data collection	SEE CAN	DIDATE SECTION	
	strategy	Operational questions			
Cai	ndidate-level	As a heuristic tool to aid i	in our inte	rpretation of impacts	
Analysisand responses to Stan, we categorized households accord- ing to the expo production systems to Hurri- cane Stan into impact clusters. The impact clu created using a two-step cluster method available through the statistical st PASW 18. Two-step cluster anal- ysis uses a distance criterion (log-likelihoo optimal number of clusters and allows for handling a mixture of categorica (standardized) continuous vari- ables (Zhang et al. 1996; Chiu et al. 2001).[]We used two "loss" variables as the input data for the creation of clusters: percent of coffee harvest and soil lost due to Hurrican chose these two variables because of the fundamental economic role play production for households in Siltepec in 2005.		Stan into impact clusters. The impact clusters were ethod available through the statistical software, sis uses a distance criterion (log-likelihood) to define ows for handling a mixture of categorical and es (Zhang et al. 1996; Chiu et al. 2001). e input data for the fee harvest and soil lost due to Hurricane Stan. We of the fundamental economic role played by coffee			
		[] We then used these clusters to explore two questions through a descriptive analysis of the remaining survey variables: What were the characteristics of house- holds that			

experienced specific degrees of loss? What were their responses?	
--	--

Structured summary of	candidate operationalization	IS
Candidate article: Hahn	-	
Construct operationaliz	ed: Vulnerability (IPCC)	
Sub-constructs	Intermediate constructs	Exposure- SEE CANDIDATE SECTION; Sensitivity- SEE CANDIDATE SECTION; Adaptive capacity- SEE CANDIDATE SECTION
	Directly operationalized constructs	
Conceptual framework		· · ·
Operationalization of sub-constructs		
43. •	Data collection	
	Operational questions	
44. •	Data collection	
	Operational questions	
45. •	Data collection	
	Operational questions	
46. •	Data collection	
	Operational questions	
Candidate-level Analysis	combined according to the equation: $CF_d = [\sum^{n}_{i=1} w_{Mj} M_{di}] / [\sum^{n}_{i=1} where CFd is an IPCC-deffcapacity) for district d, MwMi is the weight of eachcomponents in each contri-capacity were calculated,following equation:LVI - IPCC_d = (e_d - a_d)^*s_dwhere LVI–IPCCd is the LVIframework, e is the calcularDisaster and Climate Variarscore for district d (weightand Social Networks majordistrict d (weighted average$	ined contributing factor (exposure, sensitivity, or adaptive di are the major components for district d indexed by i, major component, and n is the number of major ributing factor. Once exposure, sensitivity, and adaptive the three contributing factors were combined using the

Structured summary of candidate operationalizations		
Candidate article: Jamir et al		
Construct operationalized: Vulnerability (IPCC)		
Sub-constructs	Intermediate constructs	
	Directly operationalized	Exposure- SEE CANDIDATE SECTION; sensitivity- SEE
	constructs	CANDIDATE SECTION; adaptive capacity- SEE

			CANDIDATE SECTION	
Conceptual framework		Asper theIPCC's definition and framework, vulnerability is understood as a function of three components—exposure, sensitivity and adaptive capacity.		
•	erationalization of o-constructs			
47.	Exposure	Data collection Operational questions	- SEE CANDIDATE SECTION	
48.	Sensitivity	Data collection Operational questions	- SEE CANDIDATE SECTION	
49.	adaptive capacity	Data collection Operational questions	SEE CANDIDATE SECTION	
	ndidate-level alysis			

Stru	uctured summary of c	andidate operationalizatio	ons			
	Candidate article: Luers et al					
Cor	nstruct operationalize	d: Vulnerability (IPCC)				
Sub	o-constructs	Intermediate constructs				
		Directly operationalized		State of system relative to threshold; sensitivity;		
		constructs		exposure-SEE CANDIDATE SECTION; adaptive capacity- SEE CANDIDATE SECTION		
Cor	nceptual framework					
Operationalization of						
sub-constructs						
50.	State of system	Data collection	Not valic	l/feasible		
	relative to threshold	Operational questions				
51.	Sensitivity	Data collection	Not valid	l/feasible		
		Operational questions				
52.	Exposure	Data collection	-SEE CAN	IDIDATE SECTION		
	-	Operational questions				
53.	adaptive capacity	Data collection	SEE CAN	DIDATE SECTION		
		Operational questions				
Car	ndidate-level					
Ana	alysis					

Structured summary of candidate operationalizations			
Candidate article: Notenbaert et al			
Construct operationalized: Vulnerability (IPCC)			
Sub-constructs	Intermediate constructs		
	Directly operationalized		Exposure- SEE CANDIDATE SECTION; sensitivity- SEE
	constructs		CANDIDATE SECTION; adaptive capacity- SEE
			CANDIDATE SECTION; vulnerability outcomes
Conceptual framework			
Operationalization of			
sub-constructs			
54. Exposure	Data collection	SEE CAN	DIDATE SECTION
	Operational questions		

55.	Sensitivity	Data collection	SEE CANDIDATE SECTION
		Operational questions	
56.	adaptive capacity	Data collection	SEE CANDIDATE SECTION
		Operational questions	
57.	vulnerability	Data collection	Not transparent
	outcomes	Operational questions	
Candidate-level			
Analysis			

Str	uctured summary of c	andidate operationalizatio	ons
Car	ididate article: Piya et	tal	
Cor	nstruct operationalize	d: Vulnerability (IPCC)	
Sub-constructs		Intermediate constructs	adaptive capacity- SEE CANDIDATE SECTION
		Directly operationalized	Exposure- SEE CANDIDATE SECTION; sensitivity- SEE
		constructs	CANDIDATE SECTION
Cor	nceptual framework		
Ор	erationalization of		
sub	-constructs		
58.	Exposure	Data collection	SEE CANDIDATE SECTION
		Operational questions	
59.	Sensitivity	Data collection	SEE CANDIDATE SECTION
		Operational questions	
60.	adaptive capacity	Data collection	SEE CANDIDATE SECTION
		Operational questions	
	ndidate-level alysis	(2001) is thus preferred of Gbetibouo & Ringler, 200 indicators of exposure, se Statistical Software (STAT first component of PCA a for each indicator varies of relationship with othe magnitude of the weight index. PCA was run separ capacity. Stepwise PCA w was run for the indicator importance of indicators first-step PCA, individual PCA was run using the in- asset group contributes t capacity index was calcul step PCA run for the five The normalized variables indices (for exposure, ser formulae: $Ij = \sum_{i=1}^{k} b_i[(a_{ji} - x_i)/s_i]$ where, 'I' is the respectiv (PCA1) taken as weights f mean indicator value, an vulnerability index for ea	cipal Component Analysis (PCA) following Filmer and Pritchett compared to the former two methods (Nelson et al., 2010b; 99; Cutter, Boruff, & Shirley, 2003). PCA was run for the selected ensitivity, and adaptive capacity separately in Data Analysis and TA10) software for assigning the weights. The loadings from the re used as the weights for the indicators. The weights assigned between -1 and +1, sign of the indicators denoting the direction r indicators used to construct the respective index. The s describes the contribution of each indicator to the value of the rately for the indicators of adaptive capacity. The first-step PCA s of each asset group separately to observe the relative within each asset category. From the weights obtained from index values for each of the five asset types to analyze which he most to the total adaptive capacity. Overall adaptive ated using the weights (loadings) obtained from the second asset categories. are then multiplied with the assigned weights to construct the nsitivity, and adaptive capacity separately) using the following e index value, 'b' is the loadings from first component from PCA for respective indicators, 'a' is the indicator value, 'x' is the d 's' is the standard deviation of the indicators. Finally, ch household is calculated as: $V = E + S - AC$, where, V is the exposure index, S is the sensitivity index and AC is the adaptive

capacity index for respective household.		
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Stru	uctured summary of o	candidate operationalization	ons
Can	ididate article: Sietz e	et al	
Cor	nstruct operationalize	ed: Vulnerability (IPCC)	
Sub	-constructs	Intermediate constructs	
		Directly operationalized	Exposure- SEE CANDIDATE SECTION; sensitivity- SEE
		constructs	CANDIDATE SECTION; adaptive capacity; food
			security
	nceptual framework		
-	erationalization of		
	-constructs		1
61.	Exposure	Data collection	SEE CANDIDATE SECTION
		Operational questions	
62.	Sensitivity	Data collection	SEE CANDIDATE SECTION
		Operational questions	
63.	adaptive capacity	Data collection	SEE CANDIDATE SECTION
		Operational questions	
64.	food security	Data collection	Therefore, we conducted a Household Validation Survey
			(HVS) in collaboration with CIRNMA technicians.
		Operational questions	We collected data on the purchase of food and fodder in
			2005/2006 including monetary and in-kind exchange. The
			purchase was considered in relation to an average year to compare households in a standardised way. The average year
			indicates the necessary purchase which complements the
			household's production and reserves to maintain the average
			nutritional status. We assume that changes in 2005/2006
			were primarily caused by the iden- tified weather extremes
			given that the productive resources and agricultural
			management are relatively stable over time. As smallholders
			do not maintain records of their pur-
			chase, the data collection drew on their memory recall. This
			approach provides good estimates in the absence of other
			reliable data sources, though some limitations need to be
			considered. Most importantly, this method does not account
			for memory biases. To reduce such biases, the survey referred
			to the purchase of a specific crop in a given year. Firstly,
			smallholders were asked to reflect on thecroptheyharvested
			last, starting with the previous campaign and successively
			moving backwards to the 2005/2006 campaign. This part of
			the survey was con- ducted with the aid of an abacus. Starting
			with the given number of 10 beads indicating the average
			purchase, household heads or other adult family members
			removed or added beads to quantify their relative purchase in
			2005/2006. The survey considered the five major food and
			fodder crops: potatoes, quinua, broad beans, barley and oat.
			The second part of the HVS focused on information
			about aspects of the smallholder livelihoods that help explain
			important causes for differences in purchase to support the
			interpretation and validation of the vulnera- bility clusters.
			This part involved semi-structured inter- views exploring

	effects of weather extremes on the smallholders' livelihoods,
	access to land, production zones and income, availability of
	labour as well as social and economic opportunities to cope
	with production failure. Overall, each interview took around
	45 min and was car- ried out in Spanish or Quechua according
	to the native language of the interviewees.
Candidate-level	The cluster analysis was performed using a sequence of a common hierarchical and
Analysis	exchange algorithm, i.e., hclust and kmeans, using the statistics package R (MacQueen
	1967; RDCT 2009). Based on stochastic initialisation, we calculated the reproducibility of
	partitions for a pre-given number of clusters to determine whether the algorithm
	detects stable or unstable (inappropriate) partitions. The share of households that were
	categorised in the same cluster in two partitions is expressed as "consistency measure".
	The higher this measure, the more reliable the cluster results. We calculated the
	consistency measure as the average of 200 pairwise comparisons of partitions with a
	given number of clusters. Ultimately, the consistency measure enables us to identify the
	optimal number of clusters to be analysed. Further methodological details are outlined
	in a previous application of the cluster approach to dryland vulnerability on a global
	scale (Sietz et al. 2011).
	[]
	Recognising the sensitivity of any vulnerability analysis
	to the choice of indicators, we empirically examine whe- ther the formal entities provide
	specific evidence about damages under the identified climate exposure. For this, the
	data on households' purchase collected in the HVS are related to the cluster
	membership of households. Figure 4 shows that each cluster corresponds to a relatively
	small range of the damage measure. Therefore, the similarities among the households
	revealed by the cluster analysis hold true with regard to the outcomes of the climate
	exposure.
L	

Vulnerability as Expected Poverty

Selection of most useful operationalizations (to be completed by expert reviewer)		
Construct	Vulnerability as Expected Poverty	
1 st preference	[Author (year)]	
2 nd preference	[Author (year)]	
3 rd preference	[Author (year)]	

Str	uctured summary of c	andidate operationalizatio	ons	
Car	didate article: Calvo 8	& Dercon		
Cor	nstruct operationalize	d: Vulnerability as Expecte	ed poverty	
Sub-constructs		Intermediate constructs		Individual vulnerability; aggregate vulnerability
		Directly operationalized constructs		Poverty-SEE CANDIDATE SECTION; possible states of the world; probabilities of possible states of the world.
Cor	nceptual framework			
Ор	erationalization of			
sub	-constructs			
65.	Poverty	Data collection	SEE CA	ANDIDATE SECTION
		Operational questions		
66.	possible states of	Data collection	NOT TRA	ANSPARENT
	the world;	Operational questions		
67.	probabilities of	Data collection	NOT TRA	ANSPARENT
	possible states of the world	Operational questions		
Car	didate-level			
Ana	alysis			

Stru	uctured summary of c	andidate operationalizatio	ons			
Car	ndidate article: Chhihr	n & Poch				
Cor	nstruct operationalize	d: Vulnerability as Expecte	d poverty			
Sub	o-constructs	Intermediate constructs				
		Directly operationalized		Environmental shocks; current poverty status;		
		constructs		household characteristics; poverty- SEE CANDIDATE SECTION		
Cor	nceptual framework					
Ope	erationalization of					
sub	-constructs					
68.	Environmental	Data collection	NOT TRA	NSPARENT		
	shocks	Operational questions				
69.	current poverty	Data collection	NOT TRA	NSPARENT		
	status	Operational questions				
70.	household	Data collection	A total o	f 600 questionnaires were collected from households.		
	characteristics	Operational questions	There we	ere on average five people within a household within		
			the surve	eyed areas. This is well above the national average		
			household size (4.7) in 2008 (NIS, 2008). Rolang Chork has the			
			small- es	t average household size (4.99 people per household		
			on avera	ge) and the highest level of educa- tion among its		

71.	Poverty	Data collection	population (9.6 years of schooling on average). The Kork and Chbar Mon com- munes had larger household sizes than the other selected communes (5.64 and 5.59 people per household on average, respectively). About 60% of respondents reported that their households have at least one motorcycle. There was a large variation in the proportion of households possessing motorcycles between communes, with the Chbar Mon (73%), Peang Lvea (74%) and Rolang Chork (68%) communes having a high- er percentage of motorcycle- possessing households than the Tasal (44%), Kork (50%) and Morhasaing (53%) communes. The survey also revealed that 11.7% of respondents live in households with at least one person with disability. Peang Lvea commune has the highest proportion of households containing a person with a disability (21%), followed by Rolang Chork (13%), Kork (12%), Tasal (11%), Morhasaing (7%) and Chbar Mon (6%).
/1.	Poverty	Operational questions	SEE CANDIDATE SECTION
	ndidate-level alysis	The expected log per cap generalised least squares [] Table 3 presents the resu [] Household size, the posse agriculture are significantly and inver larger the household size is -0.182, p<0.001). In add expected per capita incor depend on agricultural w households who have an p<0.001). In addition, the log per capita income, alt	Its of the FGLS analysis. ession of motor vehicle and a livelihood dependency on rsely associated with log per capita income. Specifically, the , the lower the expected log per capita income (the coefficient dition, the possession of a motor vehicle is positively related to ne (the coefficient is 0.312, p<0.001); while households who ork alone tend to have lower per capita income than those additional secondary occupation (the coefficient is -0.899, education attainment of respondents has a posi- tive effect on hough the effect is small (the coefficient is 0.044, p < 0.001). presence of person living with disability in the household does

Structured summary of	Structured summary of candidate operationalizations							
Candidate article: Deressa et al								
Construct operationaliz	ed: Vulnerability as Expecte	d poverty						
Sub-constructs	Intermediate constructs							
	Directly operationalized		Poverty- SEE CANDIDATE SECTION					
	constructs							
Conceptual framework								
Operationalization of								
sub-constructs								
72. Poverty	Data collection	SEE CA	ANDIDATE SECTION					
	Operational questions							
Candidate-level								
Analysis								

Structured summary of candidate operationalizations							
Candidate article: Echevin							
Construct operationaliz	ed: Vulnerability as Expecte	d poverty					
Sub-constructs	Intermediate constructs		Economic well-being				
	Directly operationalized		Household level- SEE CANDIDATE SECTION;				
	constructs		community level- SEE CANDIDATE SECTION				
Conceptual framework							
Operationalization of							
sub-constructs							
73. Household level	Data collection	SEE CA	ANDIDATE SECTION				
	Operational questions						
74. community level-	Data collection	SEE CA	ANDIDATE SECTION				
	Operational questions						
Candidate-level							
Analysis							

Str	uctured summary of c	andidate operationalizatio	ons	
Car	ndidate article: Günth	er & harttgen		
Cor	nstruct operationalize	d: Vulnerability as Expecte	d poverty	
Sub	o-constructs	Intermediate constructs		Risk-induced vulnerability
		Directly operationalized		household level- SEE CANDIDATE SECTION;
		constructs		Idiosyncratic shocks- SEE CANDIDATE
				SECTION; covariate shocks- SEE CANDIDATE SECTION
Cor	nceptual framework			
Ор	erationalization of			
sub	-constructs			
75.	household level	Data collection	SEE CA	ANDIDATE SECTION
		Operational questions		
76.	Idiosyncratic	Data collection	SEE CA	ANDIDATE SECTION
	shocks	Operational questions		
77.	covariate shocks-	Data collection	SEE CA	ANDIDATE SECTION
		Operational questions		
Car	ndidate-level			
Ana	alysis			

Appendix Q: Order of measures and constructs

This appendix presents the results of an assessment that attempted to determine if the data gathered in a given operationalisation was of the same order as the construct it supported. For instance, given the construct 'crop yield', the data collection method of 'remote sensing' or records of sale' would match while 'survey of farmers' would not. The construct 'crop yield' requires objective measurement of a valid indicator. Asking farmers about their crop yield provides their espoused recall of a displaced external object. The point here is not that subjective measures are necessarily suspect. For example, remote sensing data may be objective but it might not support valid measurements of crop yield. The point, rather, is that assessments of vulnerability appear to mix the results of direct measurement with subjectively mediated measurement in a manner that assumes their equivalence and we could find no evidence in the articles reviewed that this equivalence had been established. Rather than including all of the data from appendix Q, this appendix presents a summary table of the results. Judgements found in the table below can be reviewed by consulting the data presented in Appendix Q.

Research questions: given the data presented in Appendix Q:

- 1. What order of data does this operationalization provide
 - a. Respondent[|s]' espoused recall of an a displaced external object (ER, DO)
 - b. Respondent[|s]' espoused recall of a displaced subjective condition (ER, DSC)
 - c. Respondent[|s]' espousal of a displaced external object (E, O)
 - d. Respondent[|s]' espousal of a displaced subjective condition (E, SC)
 - e. Respondent[|s]' espousal of immediate circumstances (E)
 - f. Objective measurement of indicator of unit of analysis (O, I)
 - g. Objective measurement of validated indicator of unit of analysis (O, VI)
- 2. What order of data does the corresponding construct require?
 - a. Respondent[|s]' espoused recall of an a displaced external object
 - b. Respondent[|s]' espoused recall of a displaced subjective condition
 - c. Respondent[|s]' espousal of a displaced external object
 - d. Respondent[|s]' espousal of a displaced subjective condition
 - e. Respondent[|s]' espousal of immediate circumstances
 - f. Objective measurement of indicator of unit of analysis
 - g. Objective measurement of validated indicator of unit of analysis
- 3. Does 1=2?
- 4. If $1 \neq 2$, is there justification for inference?
- 5. If there is justification for inference, is that justification adequate? (not done)

Match of Measures and Constucts		Measure is				
construct	source	Order DCM	Order Concept	subjective	objective	reloar
Actual meterological Observations	Gandure et al (2013)	0-1	0-VI	•	yes	
	Westerhoff & Smit	E-				
Adaptation Strategy	(2009)	DO	0-VI	yes	yes	
	Westerhoff & Smit	E-				
Adaptive Capacity	(2009)	DO	0-VI	yes	yes	
		E-				
Adaptive Capacity	Baca et al (2004)	DO	0-VI	yes		
		E-				
Adaptive Capacity	Sietz et al (2012)	DO	0-VI	yes		
Adaptive Capacity	Luers et al (2003)	0-1	0-VI		yes	
Adaptive Capacity	lonesco et al (2009)	N/I	N/I			yes
		E-				
agricultural vulnerabilty	Jamir et al (2013)	DO	0-VI	likely		
		ER-	ER-			
agriculture dependend households	Hahn et al (2009)	DO	DO	yes		
averge precipitation	Hahn et al (2009)	0-1	0-VI	yes		
		E-				
Biphysical vulnerability	Jamir et al (2013)	DO	0-VI	likely		
		E-				
borrow-lend ratio	Hahn et al (2009)	DO	0-VI	yes		
		E-				
cereal production	Mutsvangwa (2011)	DO	0-VI	yes		
		E-				
Climate Change	Mubaya et al (2012)	DO	0-VI	yes		
		E-				
Climate change and Variability	Mubaya et al (2012)	DO	0-VI	yes		
		E-				
Climate Variability	Mubaya et al (2012)	DO	0-VI	yes		
cluster pattern analysis	Sietz et al (2012)	N/I	N/I			
	Antwi-Agyei et al	E-				
Community	(2013)	DO	0-VI	yes		
		E-				
Community Level	Echevin (2011)	DO	0-VI	yes		
Community Level	Günther & Harttgen	N/1	N/I			yes

Match of Measures and Constucts				Me	asure	is
construct	source	Order DCM	Order Concept	subjective	objective	
	(2009)			•,	Ť	
	Sarris & Karfakis	E-				
Covariate Shocks	(2010)	DO	0-VI	yes		
	Günther & Harttgen	E-				
Covariate Shocks	(2009)	DO	0-VI			ye:
		E-				
crop diversity	Hahn et al (2009)	DO	0-VI	yes		
		E-				
Current exposure to risk	Capaldo et al (2010)	DO	0-VI	likely		
		E-				
Current socio-economic characteristics	Capaldo et al (2010)	DO	0-VI	likely		
		E-				
Demographic vulnerability	Jamir et al (2013)	DO	0-VI	likely		
		E-				
dependency ratio	Hahn et al (2009)	DO	0-VI	yes		
•		E-		-		
determinants of resiliance	Tesso et al (2012)	DO	0-VI	yes		
		E-		-		
don't save crops	Hahn et al (2009)	DO	0-VI	yes		
·		E-		-		
don't save seeds	Hahn et al (2009)	DO	0-VI	yes		
	Dasgupta & Baschieri					
Drought	(2012)	0-1	0-VI		yes	
Entity	lonesco et al (2009)	N/1	N/I		-	ye:
	Westerhoff & Smit	E-				-
exposed and sensitive to climate change	(2009)	DO	O-VI	yes	yes	
-	Antwi-Agyei et al					
Exposure	(2013)	0-1	O-VI		yes	
Exposure	Baca et al (2004)	0-1	O-VI		yes	
Exposure	Luers et al (2003)	0-1	O-VI		yes	
Exposure	Piya et al (2012)	O-VI	0-VI		yes	
exposure	Sietz et al (2012)	0-1	O-VI		yes	
·	Notenbaert et al	1	-		,	
Exposure	(2013)					ye:

Match of Measures and Constucts						Measure is			
construct	source	Order DCM	Order Concept	subjective	objective	unclear			
		ER-	ER-						
Family with chronic illness	Hahn et al (2009)	DO	DO	yes					
		E-	E-						
farmer perceptions	Mubaya et al (2012)	DO	DO	yes					
		E-							
Financial Capital	Piya et al (2012)	DO	0-VI	likely					
	Antwi-Agyei et al	ER-							
Financial Capital	(2013)	DO	0-VI	yes	yes				
		ER-	ER-						
flood, drought, cyclone events	Hahn et al (2009)	DO	DO	yes					
		E-							
food from family farm	Hahn et al (2009)	DO	0-VI	yes					
		E-							
food security	Sietz et al (2012)	DO	0-VI	yes					
		E-							
household characteristics	Chhinh & Poch (2012)	DO	0-VI	yes					
	Sarris & Karfakis	E-							
Household Consumption	(2010)	DO	0-VI	yes					
		E-							
household level	Echevin (2011)	DO	0-VI	yes					
	Günther & Harttgen	E-							
household level	(2009)	DO	0-VI			yes			
		E-							
household level resilience	Tesso et al (2012)	DO	0-VI	yes					
		E-							
households with orphans	Hahn et al (2009)	DO	o-vi	yes					
		ER-	ER-						
households working elsewhere	Hahn et al (2009)	DO	Do	yes					
-		E-		-					
Human Capital	Piya et al (2012)	DO	0-VI	likely					
	Antwi-Agyei et al	E-							
Human Capital	(2013)	DO	0-VI	yes					
	Dasgupta & Baschieri	E-		-					
Human Capital	(2012)	DO	0-VI	yes					

Match of Measures and Constucts				Mea	sure	is
construct	source	Order DCM	Order Concept	subjective	objective	Incloar
	Sarris & Karfakis	E-				_
idiosyncratic shocks	(2010)	DO	0-VI	yes		
	Günther & Harttgen					
idiosyncratic shocks	(2009)	N/I	N/I			ye:
Impacts & responses to Hurricane Stan by		E-				
coffee farmers	Eakin et al (2012)	DO	0-VI	yes		
		ER-	ER-			
inconsistent water supply	Hahn et al (2009)	DO	Do	yes		
		ER-	ER-	-		
independent of local government	Hahn et al (2009)	DO	Do	yes		
		ER-	ER-	-		
injury or death from disaster	Hahn et al (2009)	DO	Do	yes		
	Notenbaert et al			-		
Institutional Environmnent	(2013)	N/1	N/I			ye:
		E-				-
inverse water stored	Hahn et al (2009)	DO	0-VI	yes		
	Dasgupta & Baschieri	E-		-		
Labour	(2012)	DO	0-VI	yes		
		E-		-		
lifelihood diversification	Hahn et al (2009)	DO	o-vi	yes		
maximum temperature	Hahn et al (2009)	0-1	0-VI	yes		
minimum consumption (income) level	Deressa et al (2009)	N/I	N/I	-		
	Westerhoff & Smit					
multiple underlying forces	(2009)					
		E-				
Natural Capital	Piya et al (2012)	DO	0-VI	likely		
	Antwi-Agyei et al	E-	-			
Natural Capital	(2013)	DO	0-VI	yes		
		ER-	ER-			-
natural water source	Hahn et al (2009)	DO	Do	yes		
		E-		/		
no warning of disaster	Hahn et al (2009)	DO	0-VI	yes		
		E-	- ••	<i>y</i>		
non-climatic stress	Mubaya et al (2012)	DO	0-VI	yes		

Match of Measures and Constucts						is
construct	source	Order DCM	Order Concept	subjective	objective	unclear
	Dasgupta & Baschieri	E-				
non-labour productive assets	(2012)	DO	O-VI	yes		
		E-				
percent of female-headed households	Hahn et al (2009)	DO	0-VI	yes		
		E-	E-			
perception of adiha farmers	Mengitsu (2011)	DO	DO	yes		
		E-				
Physical Capital	Piya et al (2012)	DO	o-vi	likely		
	Antwi-Agyei et al	E-				
Physical Capital	(2013)	DO	0-VI	yes		
preference criteria	lonesco et al (2009)	N/1	N/I	-		yes
		E-				
proximity to health facility	Hahn et al (2009)	DO	o-vi	yes		
		E-	0 11	905		
proximity to water source	Hahn et al (2009)	DO	o-vi	yes		
		E-	0 11	905		
receive-give ratio	Hahn et al (2009)	DO	0-VI	yes		
reference scenarios	lonesco et al (2009)	N/I	N/I	yes		
reference scenarios		10/1	/\//			ye:
resillient and vulnerable communities	Antwi-Agyei et al	0.1//	0-1//			
resilient and vulnerable communities	(2013)	0-VI	0-VI		yes	
	Dasgupta & Baschieri					
Risk of experiencing climate change	(2012)		0-VI		yes	
•		E-				
Sensitivity	Piya et al (2012)	DO	0-VI	likely		
Sensitivity	Luers et al (2003)	0-1	0-VI		yes	
Sensitivity	Sietz et al (2012)	0-1	0-VI		yes	
		E-				
Social Capital	Piya et al (2012)	DO	0-VI	likely		
	Antwi-Agyei et al	E-				
Social Capital	(2013)	DO	0-VI	yes		
	Dasgupta & Baschieri	E-				
Social Capital	(2012)	DO	0-VI	yes		
		E-				
Socio-economic vulnerability	Jamir et al (2013)	DO	O-VI	likely		

Match of Measures and Constucts						
				Me	asure	is
construct	source	Order DCM	Order Concept	subjective	objective	unclear
State of system relative to threshold of						
damage	Luers et al (2003)	0-1	0-VI		yes	
stimulus	lonesco et al (2009)	N/I	N/I			yes
	Günther & Harttgen	E-				
Structural Poverty	(2009)	DO	0-VI			yes
		E-				
struggle for food	Hahn et al (2009)	DO	0-VI	yes		
Threshold to damage	Luers et al (2003)	0-1	0-VI		yes	
		ER-	ER-			
uneduated headed households	Hahn et al (2009)	DO	DO	yes		
		E-				
vulnerability threshold	Mutsvangwa (2011)	DO	O-VI	likely		
		ER-	ER-			
water conflict	Hahn et al (2009)	DO	Do	yes		
		ER-	ER-			
week illness	Hahn et al (2009)	DO	Do	yes		
Wellbeing	Luers et al (2003)	0-1	0-VI		yes	

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