

LSE

THE LONDON SCHOOL
OF ECONOMICS AND
POLITICAL SCIENCE ■

LSE Research Online

Matthew I. England, Andrew J. Dougill, Lindsay C. Stringer, Katharine E. Vincent, Joanna Pardoe, Felix K. Kalaba, David D. Mkwambisi, Emilinah Namaganda and Stavros Afionis

Climate change adaptation and cross-sectoral policy coherence in southern Africa

**Article (Published version)
(Refereed)**

Original citation:

England, Matthew I. and Dougill, Andrew J. and Stringer, Lindsay C. and Vincent, Katharine and Pardoe, Joanna and Kalaba, Felix K. and Mkwambisi, David D. and Namaganda, Emilinah and Afionis, Stavros (2018) *Climate change adaptation and cross-sectoral policy coherence in southern Africa*. [Regional Environmental Change](#). ISSN 1436-3798
DOI: [10.1007/s10113-018-1283-0](https://doi.org/10.1007/s10113-018-1283-0)

© 2018 The Authors
CC BY 4.0

This version available at: <http://eprints.lse.ac.uk/87995/>
Available in LSE Research Online: May 2018

LSE has developed LSE Research Online so that users may access research output of the School. Copyright © and Moral Rights for the papers on this site are retained by the individual authors and/or other copyright owners. Users may download and/or print one copy of any article(s) in LSE Research Online to facilitate their private study or for non-commercial research. You may not engage in further distribution of the material or use it for any profit-making activities or any commercial gain. You may freely distribute the URL (<http://eprints.lse.ac.uk>) of the LSE Research Online website.



Climate change adaptation and cross-sectoral policy coherence in southern Africa

Matthew I. England¹ · Andrew J. Dougill¹ · Lindsay C. Stringer¹ · Katharine E. Vincent^{2,3} · Joanna Pardoe⁴ · Felix K. Kalaba⁵ · David D. Mkwambisi⁶ · Emilinah Namaganda⁷ · Stavros Afionis¹

Received: 20 April 2017 / Accepted: 20 January 2018
© The Author(s) 2018

Abstract

To be effective, climate change adaptation needs to be mainstreamed across multiple sectors and greater policy coherence is essential. Using the cases of Malawi, Tanzania and Zambia, this paper investigates the extent of coherence in national policies across the water and agriculture sectors and to climate change adaptation goals outlined in national development plans. A two-pronged qualitative approach is applied using Qualitative Document Analysis of relevant policies and plans, combined with expert interviews from non-government actors in each country. Findings show that sector policies have differing degrees of coherence on climate change adaptation, currently being strongest in Zambia and weakest in Tanzania. We also identify that sectoral policies remain more coherent in addressing immediate-term disaster management issues of floods and droughts rather than longer-term strategies for climate adaptation. Coherence between sector and climate policies and strategies is strongest when the latter has been more recently developed. However to date, this has largely been achieved by repackaging of existing sectoral policy statements into climate policies drafted by external consultants to meet international reporting needs and not by the establishment of new connections between national sectoral planning processes. For more effective mainstreaming of climate change adaptation, governments need to actively embrace longer-term cross-sectoral planning through cross-Ministerial structures, such as initiated through Zambia's Interim Climate Change Secretariat, to foster greater policy coherence and integrated adaptation planning.

Keywords Mainstreaming · Water · Agriculture · Malawi · Zambia · Tanzania

Editor: Chinwe Ifejika Speranza

✉ Andrew J. Dougill
a.j.dougill@leeds.ac.uk

Matthew I. England
m.i.england@leeds.ac.uk

Lindsay C. Stringer
l.stringer@leeds.ac.uk

Katharine E. Vincent
katharine@kulima.com

Joanna Pardoe
j.pardoe@lse.ac.uk

Felix K. Kalaba
kanungwe@gmail.com

David D. Mkwambisi
ddmkwambisi@gmail.com

Emilinah Namaganda
emnamaganda@gmail.com

Stavros Afionis
s.afionis@leeds.ac.uk

¹ Sustainability Research Institute, School of Earth and Environment, University of Leeds, Leeds LS2 9JT, UK

² Kulima Integrated Development Solutions (Pty) Ltd, Postnet Suite H79, Private Bag x9118, Pietermaritzburg 3200, South Africa

³ School of Architecture and Planning, University of the Witwatersrand—WITS, Private Bag 3, Johannesburg 2050, South Africa

⁴ Grantham Research Institute, London School of Economics and Political Sciences, London, UK

⁵ School of Natural Resources, Copperbelt University, Kitwe, Zambia

⁶ Department of Environmental Management Sciences, Lilongwe University of Agriculture and Natural Resources, Lilongwe, Malawi

⁷ Environmental Sciences Department, Wageningen University, Wageningen, Netherlands

Introduction

Development in southern Africa is occurring against a backdrop of climate change. This makes careful adaptation planning imperative, as climate change is projected to increase temperatures, alter the temporal and spatial distribution of rainfall and increase the severity of droughts and flooding across the region (Niang et al. 2014). Climate impacts are taking place alongside rapid social, economic and demographic transitions that combine to influence development outcomes, including interacting challenges across the nexus of food security (Ford et al. 2015), water availability and energy supply (Conway et al. 2015). Climate adaptation planning is subject to challenges of the paucity of reliable climate information (Jones et al. 2015) and uncertainties about the timing of impacts and their spatial distribution (Davis 2011). As climate change is a cross-cutting issue, adaptation needs to be mainstreamed into sector-based policies (Stringer et al. 2014) and across different levels of governance (Urwin and Jordan 2008). However, empirical analyses are limited regarding the extent to which this is happening at the national level across sub-Saharan African states with previous studies focused largely on adaptation planning in single sectors.

The aim of the study is to assess policy coherence in climate change adaptation planning in Malawi, Tanzania and Zambia. These countries have been identified as particularly vulnerable to the impacts of climate change (UNECA 2011; Abson et al. 2012) and have each experienced significant climate shocks (notably floods and droughts) in recent years. The threats that lie ahead in a warmer, dryer world are only expected to increase, thereby undermining the significant progress that these southern African countries have made in agricultural productivity, disease control and malnutrition reduction (Niang et al. 2014). Critically, these countries have recognised that recent development gains are fragile, as they have been made in climate-sensitive sectors (CDKN 2014). They are thus aware of the imperativeness of lessening impacts of climate change by enhancing coherent adaptation action (Stringer et al. 2014). In order to assess progress in pursuing policy coherence in climate change adaptation planning, this study focuses on two specific objectives:

1. To identify the extent and nature of climate change adaptation planning strategies included in the water and agricultural sector policies.
2. To assess the policy coherence across sectors, as well as with National Development Plans (NDPs) and climate change adaptation policies and strategies.

Document analysis is complemented by, and triangulated with, qualitative expert interview data. We focus on water and agricultural sectors due to their sensitivity to climate impacts and because agriculture contributes

around 20% of southern Africa's Gross Domestic Product (GDP), as well as being the dominant livelihood for the majority of the population (SADC 2012).

Adaptation as a cross-cutting policy issue

Adaptation is defined as “*adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities*” (IPCC 2007:869). In this paper, we concentrate our analysis on planned adaptation, defined as “*adaptation that is the result of a deliberate policy decision, based on an awareness that conditions have changed or are about to change and that action is required to return to, maintain, or achieve a desired state*” (IPCC 2007:869). Effective adaptation planning is needed across all sectors in a way that recognises sectoral interdependencies and policy entry points (Conway and Mustelin 2014). Indeed, the post-2015 development agenda recognises the complexities associated with the prevailing sectoral approach to policy-making and emphasises the importance of policy coherence in addressing cross-cutting challenges (Conway et al. 2015; Nilsson et al. 2016) and ensuring improved links between international climate policy and national sectoral policies (Cochrane et al. 2017). Policy coherence is defined as “*the systematic promotion of mutually reinforcing policy actions across government departments and agencies creating synergies towards achieving the agreed objectives*” (OECD 2004:3). Analyses of coherence are vital to identify where policies in different sectors are horizontally supporting or conflicting with one another, as well as the ways in which they are aligned vertically between national commitments to international agreements (Chandra and Idrisova 2011). Coherent policy approaches can lead to greater effectiveness and efficiency, and can reduce competition for limited budgets and resources (Akhtar-Schuster et al. 2011).

Policy studies outside of southern Africa to date have identified the importance of strengthening partnerships and collaborations to manage the impacts of climate change, as well as developing an appropriate institutional context and supporting policy instruments (Massey et al. 2014; Biesbroek et al. 2010). The need to build such policy activities upon cross-sector dialogue and actions has also been recognised in southern Africa by the establishment of inter-ministerial climate change committees and task forces in countries such as Malawi, Zambia and Zimbabwe (Stringer et al. 2014). That said, major implementation challenges exist in Africa, caused to a great extent by the fact that government ministries and departments often operate in relative isolation of each other, characterised by a lack of communication, information sharing and collaboration (Stringer et al. 2012). Stringer et al. (2014) identify a number of approaches that can promote institutional support

for cross-cutting policies, practices and partnerships. These include strengthening national level coordination and clearer definition of roles across sectors; partnership development drawing on competencies of different stakeholders across sectors; steps to facilitate learning and knowledge sharing; and the development of mechanisms that permit more equitable and transparent distribution of costs and benefits.

Adaptation to climate change is one of the most crucial cross-cutting issues, with African countries having taken steps to explore synergies and integration among focal areas. This study is designed to assess the effectiveness of such cross-sectoral structures in three African countries, namely Malawi, Zambia and Zimbabwe.

Research methodology

Qualitative Document Analysis (QDA) has been utilised to facilitate analysis of policy documents (e.g. Altheide et al. 2008). It provides an approach that considers the meaning and implications of text. It uses a subjective scoring system (based upon the authors' extensive sector knowledge and regional experience) followed by validation through a series of independent expert interviews. The approach adopted in this study follows several steps to improve rigour and consistency of this analysis method, including: a) setting criteria for the selection of documents; b) obtaining documents; c) analysis of documents; d) validation; e) finalisation (Altheide et al. 2008).

To begin with, in setting the boundaries of the study and the criteria for the selection of documents (step a), our sample considered official government documents from all countries within the Southern African Development Community (SADC). From this, we then focused on three countries (Malawi, Tanzania and Zambia) which have a full set of policy

documents across water and agriculture, as well as NDPs and climate change policies and strategies (Table 1). We focused on water and agriculture due to their primary role in determining climate change adaptation actions, rather than energy or forestry sector policies which focus on mitigation measures, but analysis and expert interviews did explore these wider cross-sectoral linkages.

Internet searches were then conducted to locate the sector policies on government and other relevant websites (step b). For policies that could not be located online, staff members working for relevant government departments were contacted in order to obtain the policies. With respect to document analysis (step c), these documents were systematically analysed to ascertain: i) whether adaptation was being considered or not; ii) how it was being treated; and iii) whether climate change adaptation statements were coherent with the other documents assessed. Documents were analysed using a content analysis approach (Stemler 2001) based on a scoring criteria to assess coherence (Table 2). This content analysis step comprised four stages. In the first stage, each of the sector policies (water and agriculture), NDPs and climate change policies was assessed for dominant strategies to four key themes: i) water, ii) agriculture, iii) water and agriculture inter-sector alignment for climate change adaptation, and iv) climate change adaptation. As strategies to water and agricultural adaptations were identified, we recorded the discursive context in which they were found. This led to identification of specific keywords such as "irrigation", "drought", "flood", "disaster management", "water security" and "food security".

The second stage involved using these keywords to analyse the parts of each document where they were located. This assessed water and agriculture strategies based on the content of the sentence or paragraph in which they were included within the policy, providing country-specific background

Table 1 Documents forming the sample for qualitative document analysis

Policy document	Country		
	Malawi	Tanzania	Zambia
Water Policy	National Water Policy (GoM 2005)	National Water Policy (GoT 2002)	National Water Policy (GoZ 1994)
Agricultural Policy	National Agricultural Policy (GoM 2011a)	National Agricultural Policy (GoT 2013)	National Agricultural Policy (GoZ 2011)
National Development Plans (NDP)	Malawi Growth and Development Strategy, 2011–2016 (GoM 2011b)	Tanzania National Five Year Development Plan, 2016–2021 (GoT 2016)	Revised Sixth National Development Plan 2013–2016 (GoZ 2013)
Climate Change	National Climate Change Policy (GoM 2016)	National Climate Change Strategy (GoT 2012)	National Climate Change Response Strategy (GoZ 2010)
National Adaptation Action Plan (NAPA)	Malawi's National Adaptation Programme of Action (GoM 2006)	National Adaptation Programme of Action, 2007 (GoT 2007)	National Adaptation Programme of Action Final Report (GoZ 2007)
(Intended) Nationally Determined Contribution (INDC)	Nationally Determined Contribution (GoM 2015)	Intended Nationally Determined Contribution (GoT 2015)	Nationally Determined Contribution (GoZ 2015)

Table 2 Scoring criteria to assess coherence (adapted from Le Gouais and Wach 2013)

Type of coherence	Description of coherence	Score
High coherence	The policy aligns strongly across water, agriculture and climate change statements. Policy devotes specific attention to both water and agriculture inter-sector alignment and in relation to climate adaptation. It includes numerous and detailed complementary activities and plans.	3
Partial coherence	Although the policy supports both water and agriculture inter sector alignment and relation to climate change adaptation, it is less clear and distinct how it could be achieved. A few activities and plans activities are included but lack comprehensive detail.	2
Limited coherence	The policy supports water and agriculture inter-sector alignment in relation to climate adaptation (particularly in the form of general statements). No details on activities or plans are provided.	1
No coherence	No evidence that sectoral statements are co-ordinated and/or aligned.	0

context and insights into government plans and priorities. The keywords and strategies were grouped together, and in synthesised form were entered into tables for each of the three countries. This enabled cross-comparison of the main emphases in each sector and in NDPs and climate change policies/strategies and also provided key contextual information used to guide expert interviews exploring national climate change adaptation processes. The dates of policies were recorded to enable a chronology of policy development and links to climate adaptation planning to be developed for each country.

The third stage involved searches of keywords within the respective themes. These were used to assess the extent to which the other documents referred to the same issues. For example, how did the agriculture policy, NDP, national climate change policy, NAPA and (Intended) Nationally Determined Contributions (INDCs) each refer to water? A qualitative score was then applied to the level of coherence, ranging from 3 (full coherence) to 0 (no coherence) (Table 2) for each policy for each of the 4 search terms. With regards to the theme “climate change adaptation”, for example, Malawi’s agriculture policy recognises climate change in policy and advocates a number of management strategies across sectors, stressing the importance of disaster management for floods and droughts. It was thus ascribed a score of 2.

The fourth stage focused on assessing the coherence of policies relative to each other within each country. This was based on calculating the average of the two values from stage three. For instance, the coherence of Zambia’s Agricultural Policy relative to its National Climate Change Policy is 1.5 (as the average coherence across building blocks is 1 for Zambia’s Agricultural Policy and 2 for the National Climate Change Policy).

Closing with steps d and e, validation and finalisation steps in the QDA involved national government and non-governmental expert interviews. We interviewed experts from international organisations (e.g. United Nations organisations, multilateral banks and international donor organisations) who are providing guidance on, and funding for, climate adaptation

initiatives, as well as from leading national University researchers, chosen as people working across the study sectors. Eight expert interviews were undertaken in Malawi, seven in Tanzania and five in Zambia. To ensure anonymity, it was decided not to provide any information on the role or affiliation of interviewees. Interview transcripts were coded according to sectoral themes and policy priority areas and analysed using NVivo software.

Results

Climate change adaptation planning in sectoral policies and NDPs

Climate change adaptation was not explicitly addressed in any of the water policies in the three countries, but appears in agriculture policies of both Malawi and Tanzania. For example, Malawi’s National Agricultural Policy notes that: “*Since Malawi has a low economic capacity to cope with climate change, the policy therefore seeks to urgently implement adaptation and mitigation interventions to minimize future adverse effects of climate change on agriculture*” (GoM 2011a:20). Tanzania’s agricultural policy states that: “*The Government, in collaboration with other stakeholders, shall strive to improve adaptation measures to climate change effects and deal with all the risks involved*” (GoT 2013:29). Adaptation does not feature in the agriculture policy of Zambia (GoZ 2011). Conversely, adaptation is included in several places in both Malawi and Zambia’s NDPs, and Zambia’s was revised in 2013 with mainstreaming of climate change as an explicit aim. This is partly driven by donor funding provided by Multilateral Development Banks to support the integration of climate change into National Development Plans, and also recent humanitarian problems associated with extreme climate events witnessed by the countries such as the 2015/16 El Niño event. Indeed, Malawi’s NDP emphasises the importance of “*mainstreaming climate*

change adaptation aimed at protecting water and sanitation infrastructure against damages and safeguarding communities against flooding, disease outbreaks and water scarcity during events of heavy precipitation and droughts” (GoM 2011b:103). Similarly in Tanzania, the two latest 5 year Development Plans (2011–2016; and 2016–2021) both include substantial references to climate change. Inclusion of adaptation in sector policies indicates that climate adaptation is starting to become mainstreamed within Tanzanian planning.

Policy coherence across sectors and with NDPs/climate change policies

A large and diverse range of water and agriculture adaptation strategies were identified in policy documents for each country (Table 3). The majority of the strategies that are detailed in water and agriculture sectoral policies are also mentioned in similar (or exact) wording in climate change documents (NAPA, NCCP and (I)NDCs) and the NDPs, but with limited extensions in the most recent policy statements. While the strategies in NDPs recognise that climate conditions are dynamic and that actions are required to attain a desired state, whether adaptations are specifically to climate change or to broader economic, political, social and environmental changes remains unclear.

Water and agriculture management strategies that represent adaptations to climate change cover both extreme weather events (notably floods and droughts) and longer term trends. For water, this includes improved management and investments in dams, irrigation and rainwater harvesting, addressing projections of drier future climates (Jiménez Cisneros et al. 2014). We note that the strategies remain incremental, rather than supporting transformational adaptation as widely advocated (e.g. Pelling et al. 2015). This can partly be explained by the limited awareness of longer-term climate scenarios /projections to inform planning across all government departments in the study countries (e.g. Vincent et al. 2017). Longer term adaptation strategies were more diverse, but less regularly mentioned, than short-term event-based issues that have a more immediate risk and disaster management need in both agriculture and water policies. The most frequently mentioned water management strategies include disaster management for floods and droughts, water conservation, groundwater management and rainwater harvesting. Examples of longer term adaptations relating to water include integrated water resources management, improving coverage and access to urban and domestic water supply, increasing reservoir water storage and enhancing hydropower generation capacity.

The most frequently mentioned strategies for agriculture include food and nutrition security, livestock management, risk management (including early warning systems for crops), food and seed storage systems and the appropriate use of

fertilisers and pesticides. Common examples of longer term adaptations in the agricultural sector include soil and crop research, use of appropriate technology and irrigation development. Analysis of recent changes and updates to climate change documents revealed repeated concerns about an increase in the frequency and severity of floods and droughts. This was particularly apparent in the 2015 (I)NDC statements. For example, Zambia’s NDC states that it is a “*highly vulnerable country to the adverse impacts of climate change especially droughts and floods*” (GoZ 2015:7). Tanzania’s INDC notes that “*currently more than 70% of all natural disasters in Tanzania are climate change related and are linked to recurrent droughts and floods*” (GoT 2015:3), while Malawi’s NDC states that the “*major climate related hazards that wreak havoc in the country are floods and droughts*” (GoM 2015:1). Similarly, the NAPAs and NCCPs of all three countries single out the importance of managing floods and droughts. A range of water and agriculture management strategies are advocated, including the development of early warning systems to strengthen national and local water and food security.

When we consider the extent of policy coherence around adaptation, analysis shows that Zambia has the most coherent set of policies, followed by Malawi and then Tanzania (Table 4). Results indicate that NAPAs provide the most coherence with respect to the other documents examined. This reflects the nature of their development and its differences compared to typical national policy development documents. NAPAs act as an adaptation-focused collation of existing sectoral plans and a specific project funding list aimed at external funding bodies rather than a binding guide for future sectoral policy development. For example, Tanzania’s NAPA and National Climate Change Strategy recognise vulnerability to climate change impacts, with the Strategy stating: “*Tanzania’s NAPA ranked agriculture and food security as the most vulnerable and important sector that is severely impacted by climate change and advocated that studies on the impact of climate change in the sector and on food security be a priority activity*” (GoT 2012:27).

Whilst Zambia (55) scores higher than Tanzania (42) and Malawi (49), optimal coherence would give a total possible score of 90. Our findings thus indicate that the level of integration of climate change adaptation into sector policies remains partial, with no scores of 3 being recorded for any country. Challenges to, and opportunities for, achieving more integrated policy development for enhanced adaptation were a key focus of expert interviews that validated and discussed the patterns shown in Table 4. With regards to the equality weighting of the scoring system across the range of policies, the NAPAs, INDCs and CC policies score well with regards to climate change, whereas sector policies (water, agriculture and NDPs) less so, particularly the older ones. However, sector policies and NDPs score higher with regards to water, agriculture and development, but lower on climate change issues.

Table 3 Coherence of policy documents for key themes and adaptation keywords for Malawi, Tanzania and Zambia (score 3 = high coherence; 2 = partial coherence; 1 = limited coherence; 0 = no coherence)

A. Malawi	Water Policy	Agriculture Policy	National Development Plan	National Climate Change Policy	National Adaptation Programme of Action	Nationally Determined Contribution
Water	N/a	(2) Recognises linkage between water and agriculture, supports development of irrigation schemes including a number of plans.	(2) Supports Green Belt Initiative and an increase in the area under irrigation. Includes some plans.	(1) Recognises water scarcity as issue of concern. No details.	(2) Highlights implications on water security owing to climate change. Details some adaptation approaches, plans and activities.	(1) Highlights vulnerability of water sector to climate change impacts. Does not include detailed plans.
Agriculture	(1) Recognises agricultural dimensions to water management, but lacks details.	N/a	(2) Supports Green Belt Initiative and an increase in the area under irrigation.	(1) Highlights vulnerability of rainfed agriculture. Details numerous land use and agricultural practises.	(2) Highlights vulnerability of rainfed agriculture to climate change. Details numerous activities and plans.	(1) Highlights vulnerability of agricultural sector to climate change impacts. Lists a few activities but lacks details.
Water and agriculture inter-sector alignment for Climate change adaptation	(1) Contains a few general statements regarding inter-sector alignment but no specific approaches or plans.	(2) Contains general statements inter-linking water and agriculture and a few plans.	(2) The policy inter-links water and agriculture and provides a number of plans through the Green Belt Irrigation project.	(1) Only one mention of complementarity between water and agriculture. No plans detailed.	(2) Call for a multi-sector approach encompassing water and agriculture. Projects targeted at rural communities, includes plans.	(1) General statement on vulnerability of sector to climate change. No detailed plans.
Climate change adaptation	(1) Recognises climate change, advocating disaster preparedness and management. No plans.	(2) Recognises climate change in policy and advocates a number of management plans across sectors.	(1) Recognises climate change as issue. However, fails to explicitly link it to climate change. No Plans.	(3) Details climate change impacts and some adaptation approaches. Includes some detailed plans.	(3) Details climate change impacts and livelihood activities. Includes detailed plans.	(2) Recognises climate impacts across the country, some plans but lacks specific details in terms of adaptation.
Mean	1	2	1.75	1.75	2.25	1.25
b. Tanzania	Water Policy	Agriculture Policy	National Development Plan	National Climate Change Strategy	National Adaptation Programme of Action	Nationally Determined Contribution
Water	N/a	(1) Recognises agriculture but does not include specific strategies.	(1) Recognises importance of water for livelihoods and development. No detailed plans.	(2) Policy recognises climate change vulnerability and details some plans for water approaches for adaptation.	(3) Acknowledges the importance of water for climate adaptation. Activities detailed with prioritisation and ranking system.	(1) General statement about the importance of water in the context of climate change adaptation. No detailed plans.
Agriculture	(2) Recognises agriculture and includes some examples of approaches including water use efficiency and irrigation.	N/a	(1) Recognises importance of agriculture for livelihoods and food production. Lacks detailed plans.	(2) Policy highlight importance of agriculture and food security. Details a few agricultural approaches.	(3) Recognition of the vulnerability of agriculture. Numerous agricultural approaches mentioned including prioritisation and ranking.	(1) No explicit reference to the importance of agricultural vulnerability or adaptation approaches. No detailed plans.

Table 3 (continued)

A. Malawi	Water Policy	Agriculture Policy	National Development Plan	National Climate Change Policy	National Adaptation Programme of Action	Nationally Determined Contribution
Water and agriculture inter-sector alignment for climate change adaptation	(1) Policy contains a few general statements about inter-sector alignment but lacks details and plans.	(1) Policy contains a few references to inter-sector alignment but lacks details and plans.	(0) No explicit reference to inter-sector alignment. No plans detailed.	(1) Statements concerning climate change risk, but no mention of plans.	(2) Statements of how climate change risks will impact food and water security. Plans to improve irrigated crop production.	(1) Only two mentions of complementarity between water and agriculture in general statements of intent. No plans detailed.
Climate change adaptation	(0) Does not recognise climate change as an issue. No plans provided.	(1) Recognises climate change potential impacts but lacks details on adaptation approaches.	(0) Does not explicitly mention climate change or offer any adaptation approaches.	(3) Details climate change impacts. Includes numerous adaptation approaches.	(3) Details climate change impacts. Details a number of approaches as adaptation.	(2) Recognises climate change impacts and numerous adaptation approaches, and includes some plans.
Mean	1	1	0.5	2	2.75	1.25
c. Zambia	Water Policy	Agriculture Policy	National Development Plan	National Climate Change Policy	National Adaptation Programme of Action	Nationally Determined Contribution
Water	N/a	(2) Policy recognises importance of water for agricultural production and includes irrigation and water conservation plans.	(2) Recognises importance of water for overall development, including numerous activities and approaches.	(2) Recognition of the impacts on climate change. Detailed account of water management plans.	(3) Recognition of the adverse impacts of climate change on water resources. Detailed account of specific plans.	(2) Recognition of climate change impacts on water security. Mentions water management approaches and plans.
Agriculture	(2) Policy recognises importance of water and includes irrigation system improvement to increase food production.	N/a	(2) Recognises importance of agriculture for development and food security, includes numerous activities and approaches.	(2) Recognition of the impacts on agriculture and implication for food security. Plans outlined.	(3) Rainfed agriculture highlighted as vulnerable to climate. Numerous plans detailed for agricultural adaptation.	(1) Outlines climate change impacts on crop production. Lacks detailed plans.
Water and agriculture inter-sector alignment for climate change adaptation	(1) General statement on importance of inter-sector linkage but no mentioned projects or plans.	(2) Recognises importance of inter-sector linkages and includes a number of approaches to achieve integration. Includes some plans.	(2) Document recognises water and agriculture inter-linkage and provides details of some associated plans and projects.	(1) Policy contains general statement on inter-linkages but lacks details on approaches and plans.	(2) Overarching statements including water and food security. Specific plans explicitly link water and agriculture.	(2) Recognition of climate change impacts through droughts and floods. A number of plans regarding management water and agriculture.
Climate change adaptation	(0) Does not explicitly mention climate change as an issue or provide adaptation responses.	(0) Does not explicitly mention climate change as an issue or provide any adaptation responses.	(2) Recognises climate change as an issue of concern. Contains numerous approaches to adaptation.	(3) Details climate change impacts. Details a number of specific adaptation approaches.	(3) Details climate change, including a number of specific adaptation approaches.	(3) Details potential climate change and a number of specific adaptation approaches.
Mean	1.33	1	2	2	2.75	2

Table 4 Coherence of policy documents within Malawi, Tanzania and Zambia (3 = high coherence; 2 = partial coherence; 1 = limited coherence; 0 = no coherence)

	Water Policy	Agriculture Policy	NDPs	National Climate Change Policy	NAPAs	(I) NDs	Total
Malawi							
Water Policy (2002)		1.5	1.37	1.37	1.62	1.12	6.98
Agriculture Policy (2011)	1.5		1.87	1.87	2.12	1.62	8.98
National Development Plans (2011)	1.37	1.87		1.75	2	1.5	8.49
National Climate Change Policy (2012)	1.37	1.87	1.75		2	1.5	8.49
National Adaptation Programme of Action (2006)	1.62	2.12	2	2		1.75	9.49
Nationally Determined Contribution (2015)	1.12	1.62	1.5	1.5	1.75		7.49
Total coherence scores	6.98	8.98	8.49	8.49	9.49	7.49	49.92
Tanzania							
Water Policy (2012)		1	0.75	1.5	1.87	1.12	6.24
Agriculture Policy (2013)	1		0.75	1.5	1.87	1.12	6.24
National Development Plan (1999)	0.75	0.75		1.25	1.62	0.87	5.24
National Climate Change Strategy (2012)	1.5	1.5	1.25		2.37	1.62	8.24
National Adaptation Programme of Action (2007)	1.87	1.87	1.62	2.37		2	9.73
Intended Nationally Determined Contribution (2015)	1.12	1.12	0.87	1.62	2		6.73
Total coherence scores	6.24	6.24	5.24	8.24	9.73	6.73	42.42
Zambia							
Water Policy (1994)		1.16	1.66	1.66	2.04	1.66	8.18
Agriculture Policy (2004)	1.16		1.5	1.5	1.87	1.5	7.53
National Development Plan (2013)	1.66	1.5		2	2.37	2	9.53
National Climate Change Strategy (2011)	1.66	1.5	2		2.37	2	9.53
National Adaptation Programme of Action (2010)	2.04	1.87	2.37	2.37		2.37	11.02
Nationally determined contribution (2015)	1.66	1.5	2	2	2.37		9.53
Total coherence scores	8.18	7.53	9.53	9.53	11.02	9.53	55.32

Expert interview verification and insights

Interviews with NGO, donor and university experts in each country discussed the findings and scores in Table 3 and explored the political economy of climate change adaptation planning. Initial national adaptation commitments in all three countries were developed for the NAPAs. However, it was stressed that these documents were produced rapidly, with their writing typically based on external consultancy input with “*an emphasis on large projects requiring multi-lateral funding. (I)NDCs were also typically produced rapidly to suit internationally-driven timeframes*” (international organisation representative, Malawi), with “*poor in-country awareness of the document’s existence, yet alone involvement in its production*” (policy advocacy representative, Malawi). There remain significant conflicts between some of the NDC commitments with national policies in other sectors, most notably with regard to energy and forestry. This shows that despite the establishment of cross-ministerial national climate change

technical committees, only limited cross-sectoral planning has been supported to date. Each of the three countries has developed national climate change policies and/or national climate change strategies within the last 6 years, but the experiences are different in each case as detailed below.

a. Malawi

Expert interviews in Malawi highlighted problems with the current institutional and governance arrangements in which climate change adaptation issues are being addressed. These issues have previously been highlighted in relation to limited climate information use (Vincent et al. 2017), institutional governance complexity around climate-smart agriculture initiatives (Dougill et al. 2017) and the lack of integrated planning between national policies and international environmental agreement communications (Stringer et al. 2010, 2014). Differing timeframes and ages of policies were also identified as significant impediments to the enabling of policy

coherence (government, NGO and international organisation representatives). At a sector level, there remain significant concerns on the lack of capacity and co-ordination in policy development and implementation processes. For example, one donor interviewee noted that “*irrigation schemes on both small-scale and large-scale were stalled due to disagreements between the Ministry of Finance and Department of Irrigation over who would manage funds*”.

Particular political problems were stressed in many discussions. Recent corruption scandals and the regular changes seen in personnel at ministerial, permanent secretary and director level in sectoral ministries act as barriers to policy development and revisions. Whilst technical level coordination has improved, an international organisation representative highlighted that significant barriers remain at higher levels. There have recently been cases where high level political commitment can push through policies and decisions rapidly. For example the Department of Disaster Management Affairs, within the Office of the President and Cabinet, has recently gained a high profile through major flooding (January 2015) and drought events (linked to El Niño in 2015/16) and is leading a National Resilience Strategy. Similarly, the National Disaster Management Policy, which had been in draft for many years, was rapidly ratified in 2015 following a public statement by the President that the policy was in existence.

Attempts have been made to create an enabling environment to improve policy coherence and encourage more integrated climate adaptation planning through managing the incentives or barriers to reform of relevant institutional structures. Climate change adaptation is managed across sectors through the National Steering and Technical Committees on Climate Change. The Environmental Affairs Department (EAD) is in charge of implementing the cross-cutting National Climate Change Policy. Although this policy has been approved after many years in draft, challenges were noted by all interviewees with regards to links to sectoral policies which influence its implementation and impacts. These include the inability of the EAD to insist on changes in sectoral planning or policy development due to its status as a government department “*on the same rung of the ladder*” (NGO representative). Interviews also stressed the financial resource constraints with “*expenditure reviews showing that only about 3.5% of government spending goes to climate change, disaster and water issues, despite their priority in the NDP*” (international organisation representative). The inability of this funding to reach District levels where development plans are required to include climate adaptation is a particular problem given the commitment to decentralised governance across Malawi.

b. Tanzania

Discussions with experts in Tanzania suggest that climate change has increasingly been incorporated into policy over the past ten years largely as a result of international influence and funding support, together with increasing realisations of climate change impacts. However, climate change adaptation in policy remains highly sector specific. Interviews highlighted that the lack of coherence between sectors is a product of an ingrained tradition of sectoral working, exacerbated by tight sectoral budgets. Several non-governmental experts mentioned Ministry concerns with protecting limited budgets as a key challenge to cross-sectoral collaboration. For example, the irrigation division has moved regularly between being based in the Ministry of Agriculture and the Ministry of Water over the last twenty years, without building strong cooperative links between the two sectors.

Another key barrier to policy coherence is the lack of an overarching climate change policy to pull the sectors together. A new climate change policy aiming to enhance coherence and mainstreaming of climate change across various government sectors is in development by the Department for Environment under the Vice President’s Office, but this Department is widely viewed by respondents as having only limited political influence.

Tanzania has also been affected by infrequent and delayed policy revisions. The national sectoral policies have been designed without specific review dates and recent history shows that these policies have rarely been updated. The National Water Policy was first produced in 1991 with a revised policy issued in 2002. In the case of the agriculture sector, the only National Agriculture Policy was produced in 2013. The infrequent revisions of sectoral policies suggest that any new policy developed to improve mainstreaming and cross-sectoral coherence is viewed as unlikely to be effective in the near term (both NGO and international organisation representatives).

Table 3 shows that many of the policy statements relating to climate change remain general and lacking in specific plans and strategies to promote adaptation. The expert interviews highlighted that this is partly the result of limited information on specific climate change impacts for Tanzania (NGO representative). One donor interview highlighted climate change as an emerging issue that is not yet fully understood. Another commented that “*climate change is a new phenomenon. That is why studies are very important to close the gap ... information [from studies] are set to improve policies and planning*”. Interviews also highlighted concerns that policies and plans do not necessarily result in effective actions at District levels.

c. Zambia

Part of the reason that Zambia scored highest for policy coherence is because national policies for water, agriculture, forestry and other climate related sectors have all been undergoing recent reviews to incorporate issues of climate change and improve coherence with other sectoral policies in line with donor demands (Kalaba et al. 2014). However, the inter-ministerial and inter-departmental linkages in relation to climate change adaptation are still subject to challenges with many respondents highlighting remaining implementation challenges despite the policy coherence. Zambia's Interim Climate Change Secretariat (ICCS) has been tasked to integrate climate change across government, and is staffed by representatives from different sectoral ministries, leading to improved awareness of climate issues across government. Although this has facilitated improved communication, adaptation interventions are still typically project-driven, something which was stated as a constraint by Government and NGO representatives alike. The ICCS currently sits under the Ministry of Finance, but the policy holder is the Ministry of Lands, Natural Resources and Environmental Protection. Until the climate change policy passes through cabinet, long-term institutional arrangements are uncertain and there remains *“a strong need for climate change champions at times of policy revision”* in sectoral ministries (international organisation representative).

The Revised Sixth National Development Plan (R-SNDP) explicitly mainstreamed climate resilience, but expert interviews highlighted that such national plans, are typically drafted by external consultants and not according to national needs and sectoral priorities. These consultants have access to other policy documents and are simply tasked to provide documents that are consistent with other national policies. One policy advocacy actor at national level highlighted that: *“There is pressure by donors to show compatibility of policies in addressing climate compatible developmental projects. To ensure funding of project activities, donors currently want to see coherence of policies in climate change disaster management, adaptation and mitigation.”*

The externally driven impetus for policy coherence has important implications for sectoral implementation. It was highlighted by NGO representatives that sectors are not familiar with the contents of climate change policies due to the top-down, externally-led approach of policy development. The mainstreaming of climate change across agriculture, water and energy sectors as outlined in the latest NDP currently *“lacks implementation due to limited financial resources, lack of expertise at district levels and a lack of ownership of strategies and policies at local scales”* (international organisation representative). This focus on problems associated with institutional arrangements and policy implementation

highlight that greater policy coherence alone will not ensure improved climate change adaptation planning.

Discussion

Policy coherence is vital to provide non-conflicting signals and to enable climate adaptation planning to become mainstreamed. Our analysis shows that considerable scope remains to develop a more mutually supportive policy mix across the water and agricultural sectors capable of providing benefits across both sectors. However, the current reliance on external (often international) consultants to develop policy documents reduces opportunities for consultation across government ministries, meaning that opportunities for greater coherence are being missed. Our findings highlight that policy coordination remains weak across southern Africa and needs to be strengthened to allow greater support to cross-sectoral planning. This calls for improved vertical (to include links to District Management Plans) and horizontal cross-ministerial coordination in drafting the terms of reference for policy development. Timing is also an issue, as key political and climatic events and associated resilience planning need to be harnessed to drive cross-sectoral changes. Currently, policies often remain in draft form for many years before they are adopted, such that they become outdated in relation to dominant paradigms or problems before they have been approved.

Our analysis has highlighted a number of concerns. First, most of the national water and agriculture sector policies analysed failed to explicitly include consideration of climate change vulnerabilities, impacts and potential adaptations. Sectoral policy documents were developed before the policy development process was sensitised to climate change vulnerability and impacts, with iterations of sectoral policies not including all of the actions and priority areas reported on through climate change reporting via NAPAs and (I)NDCs. Problems of limited policy coherence are exacerbated as the long-term impacts of climate change are poorly understood at a national level (Jones et al. 2015; Vincent et al. 2017) and are not explicitly addressed in policy formulation. Chronological analysis combined with keyword analysis indicates that sectoral policies have been used as a valuable basis for developing climate change strategies, policies and actions (Table 3). Where coherence between sector and climate policies and strategies is strongest, it appears that recently published climate policies are largely repackaging existing sectoral policy statements, rather than building new linkages. This matches observations for other countries such as China (Hallding et al. 2009). Such policy repackaging appears to be happening in the absence of learning and critical evaluation of the success and appropriateness of sector policy efforts, and does little to channel attention towards mainstreaming climate change adaptation. It is important to note that limiting climate change

policies to strategies listed in existing sectoral policies to improve coherence is not in itself useful and suggests that recent (I)NDCs are not acting as a catalyst for national climate actions (Day et al. 2015). The limited scope of (I)NDCs also shows that links to District-level planning processes which are vital to create a step-change in practical climate change adaptation planning (Urwin and Jordan 2008) are not yet being realised.

Second, our findings identify that the water, agriculture and climate change policies show greatest cross-thematic coherence around disaster management and planning, linked to flooding and droughts. Such a focus permits the uncertainty associated with climate change impacts to be used to justify reactive rather than pro-active responses. Some of the policy documents analysed outlined a wide range of strategies that could be considered long-term adaptations, such as integrated water management and efforts to increase crop production efficiency. However, these intentions require further support in the way of new policy instruments, alongside the development of financial and economic mechanisms at both international and national levels that can help to create an enabling environment (Akhtar-Schuster et al. 2011). This requires reconciliation between policy statements that target the long-term and the short-term nature of policy planning linked to electoral cycles and the need for immediate as well as long-term economic gains.

Third, greater awareness is needed of the economic context of adaptation planning decisions if they are to be adequately supported. We note that all of the documents in our analysis presented climate change adaptation as a challenge rather than an opportunity for development and there was little evidence that social and cultural contexts and the wealth of indigenous knowledge in the region were considered. This supports findings from complementary research across the SADC region (e.g. Conway et al. 2015) which identifies the need to better use climate information to guide long-term development planning and sectoral policy development.

Conclusion

Our analysis suggests that policy coherence around climate change adaptation needs better horizontal climate governance co-ordination at the national level involving all relevant sectoral stakeholders. This will need to be enabled by improved institutional structures before policies can present a coherent approach to adaptation. The Paris Agreement and the Sustainable Development Goals (SDGs), provide useful entry points for advances in cross-sectoral planning in relational to national climate statements. The SDGs incorporate economic, social and environmental aspects and recognise their inter-linkages in achieving sustainable development. Indeed, with the adoption of the SDGs all UN Members have committed to

“pursue policy coherence and an enabling environment for sustainable development at all levels and by all actors” (UN 2016). The SDGs even include a dedicated target (17:14) on the means of implementation to “enhance policy coherence for sustainable development” (UN 2015). Countries need to use the opportunities within such international processes to leverage the necessary resourcing and financial support to update sectoral policies so as to improve their climate adaptation plans and cross-sectoral policy coherence.

Funding information This work was funded by Future Climate for Africa (FCFA) programme as part of the UMFULA regional consortium project (NE/M020207/1). The FCFA programme is funded jointly by the Natural Environmental Research Council (NERC) and UK Department for International Development (DFID).

Open Access This article is distributed under the terms of the Creative Commons Attribution 4.0 International License (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted use, distribution, and reproduction in any medium, provided you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if changes were made.

References

- Abson DJ, Dougill AJ, Stringer LC (2012) Using principal component analysis for information-rich socio-ecological vulnerability mapping in southern Africa. *Appl Geogr* 35(1–2):515–524. <https://doi.org/10.1016/j.apgeog.2012.08.004>
- Akhtar-Schuster M, Thomas RJ, Stringer LC, Chasek P, Seely MK (2011) Improving the enabling environment to combat land degradation: institutional, financial, legal and science-policy challenges and solutions. *Land Degrad Dev* 22:299–312. <https://doi.org/10.1002/ldr.1058>
- Altheide D, Coyle M, DeVriese K, Schneider C (2008) Emergent qualitative document analysis. In: Hesse-Biber SN, Leavy P (eds) *Handbook of Emergent Methods*. Guilford press, New York, pp 127–151
- Biesbroek R, Swart RJ, Carter T, Timothy R (2010) Europe adapts to climate change: comparing national adaptation strategies. *Glob Environ Chang* 20(3):440–450. <https://doi.org/10.1016/j.gloenvcha.2010.03.005>
- CDKN (2014) The IPCC’s Fifth Assessment Report: What’s in it for Africa? Available at: https://cdkn.org/wp-content/uploads/2014/04/J1731_CDKN_FifthAssesmentReport_WEB.pdf
- Chandra A, Idrisova A (2011) Convention on biological diversity: a review of national challenges and opportunities for implementation. *Biodivers Conserv* 20(14):3295–3316. <https://doi.org/10.1007/s10531-011-0141-x>
- Cochrane L, Cundill G, Ludi E, New M, Nicholls RJ, Wester P, Cantin B, Murali KS, Leone M, Kituyi E, Landry M-E (2017) A reflection on collaborative adaptation research in Africa and Asia. *Reg Environ Chang* 17(5):1553–1561. <https://doi.org/10.1007/s10113-017-1140-6>
- Conway D, Mustelin J (2014) Strategies for improving adaptation practice in developing countries. *Nat Clim Chang* 4(5):339–342. <https://doi.org/10.1038/nclimate2199>
- Conway D, Archer van Garderen E, Deryng D, Dorling S, Krueger T, Landman W, Lankford B, Lebek K, Osborn T, Ringler C, Thurlow J, Zhu T, Dalin C (2015) Climate and southern Africa’s water-energy-

- food nexus. *Nat Clim Chang* 5(9):837–846. <https://doi.org/10.1038/nclimate2735>
- Davis C (2011) Climate risk and vulnerability: a handbook for southern Africa. Council for Scientific and Industrial Research, Pretoria Available at: <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.974.6827&rep=rep1&type=pdf>
- Day T, Röser F, Tewari R, Kurdzile M, Höhne N (2015) Preparation of intended nationally determined contributions (INDCs) as a catalyst for climate action. NewClimate Institute. Available at: <https://mitigationpartnership.net/indcs-catalysts-climate-action>
- Dougill AJ, Whitfield S, Stringer LC, Vincent K, Wood BT, Chinseu EL, Steward P, Mkwambisi DD (2017) Mainstreaming conservation agriculture in Malawi: knowledge gaps and institutional barriers. *J Environ Manag* 195(Pt 1):25–34. <https://doi.org/10.1016/j.jenvman.2016.09.076>
- Ford JD, Berrang-Ford L, Bunce A, McKay C, Irwin M, Pearce T (2015) The status of climate change adaptation in Africa and Asia. *Reg Environ Chang* 15(5):801–814. <https://doi.org/10.1007/s10113-014-0648-2>
- GoM, (Government of Malawi) (2005) National Water Policy. <http://www.gsomalawi.org/fil1/National%20Water%20Policy%20FINAL.pdf>
- GoM, (Government of Malawi) (2006) Malawi's National Adaptation Programme of action. First edition. Available at: <http://unfccc.int/resource/docs/napa/mwi01.pdf>
- GoM, (Government of Malawi) (2011a) National agriculture policy. Government of Malawi. Available at: https://reliefweb.int/sites/reliefweb.int/files/resources/NAP_Final_Signed.pdf
- GoM, (Government of Malawi) (2011b) Malawi Growth and Development Strategy, 2011–2016. Available at: <http://www.mw.one.un.org/wp-content/uploads/2014/04/Malawi-Growth-and-Development-Strategy-MGDS-II.pdf>
- GoM (Government of Malawi) (2015) Nationally Determined Contribution of Malawi. Available at: <http://www4.unfccc.int/ndcregistry/PublishedDocuments/Malawi%20First/MALAWI%20INDC%20SUBMITTED%20TO%20UNFCCC%20REV.pdf>
- GoM (Government of Malawi) (2016) National Climate Change Policy. Available at: <https://reliefweb.int/sites/reliefweb.int/files/resources/NCCM-Policy-Final-06-11-2016.pdf>
- GoT, (Government of Tanzania) (2002) National Water Policy. Available at: <http://www.tawasanet.or.tz/files/Tanzania%20water%20policy%20-%202002.pdf>
- GoT, (Government of Tanzania) (2007) National Adaptation Programme of Action. Available at: <http://unfccc.int/resource/docs/napa/tza01.pdf>
- GoT, (Government of Tanzania) (2012) National Climate Change Strategy. Available at: <http://tanzania.um.dk/en/~media/Tanzania/Documents/Environment/TANZANIA%20CLIMATE%20CHANGE%20STRATEGY/TANZANIA%20CLIMATE%20CHANGE%20STRATEGY.pdf>
- GoT, (Government of Tanzania) (2013) National Agricultural Policy. Available at: http://www.fao-ilo.org/fileadmin/user_upload/fao_ilo/pdf/ICA_MLW_and_TZ/NATIONAL_AGRICULTURAL_POLICY-2013.pdf
- GoT, (Government of Tanzania) (2015) Intended Nationally Determined Contribution. Available at: http://www4.unfccc.int/submissions/INDC/Published%20Documents/United%20Republic%20of%20Tanzania%E2%80%8B/1/INDCs_The%20United%20Republic%20of%20Tanzania.pdf
- GoT, (Government of Tanzania) (2016) National Five Year Development Plan, 2016–2021. Available at: http://www.mof.go.tz/mofdocs/msemaji/Five%202016_17_2020_21.pdf
- GoZ, (Government of Zambia) (1994) National Water Policy. Available at: http://washwatch.org/uploads/filer_public/68/a3/68a3aaa3-4359-48f5-a37e-03dfb6ebff5/national_water_policy_ministry_of_energy_and_water_development_1994.pdf
- GoZ, (Government of Zambia) (2007) National Adaptation Programme of Action, Final Report. Available at: <http://unfccc.int/resource/docs/napa/zmb01.pdf>
- GoZ, (Government of Zambia) (2010) National Climate Change Response Strategy. Available at: http://www.adaptation-undp.org/sites/default/files/downloads/zambia-climate_change_response_strategy.pdf
- GoZ, (Government of Zambia) (2011) National Agricultural Policy. Available at: <https://www.g-fras.org/en/2015-05-28-15-50-27/australia-22.html?download=319:the-national-agriculture-policy-2012-2030>
- GoZ, (Government of Zambia) (2013) Revised Sixth National Development Plan, 2013–2016. Available at: <http://images.mofcom.gov.zm/201507/20150730164403680.pdf>
- GoZ, (Government of Zambia) (2015) Nationally Determined Contribution to the 2015 Agreement on Climate Change. Available at: http://www4.unfccc.int/ndcregistry/PublishedDocuments/Zambia%20First/FINAL+ZAMBIA%27S+INDC_1.pdf
- Hallding K, Han G, Olsson M (2009) China's climate- and energy-security dilemma: shaping a new path of economic growth. *J Curr Chin Aff* 38:119–134
- IPCC (2007) Appendix I: glossary. In: Parry ML, Canziani OF, Palutikof JP, Van der Linden PJ, Hanson CE (eds) *Climate change 2007: impacts, adaptation and vulnerability. Contribution of working group II to the fourth assessment report of the intergovernmental panel on climate change*, Cambridge University press, Cambridge
- Jiménez Cisneros BE, Oki T, Arnell NW, Benito G, Cogley JG, Döll P, Jiang T, Mwakalila SS (2014) Freshwater resources. In: Field CB, Barros VR, Dokken DJ, Mach KJ, Mastrandrea MD, Bilir TE, Chatterjee M, Ebi KL, Estrada YO, Genova RC, Girma B, Kissel ES, Levy AN, MacCracken S, Mastrandrea PR, White LL (eds) *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp 229–269
- Jones L, Dougill AJ, Jones R, Steynor A, Watkiss P, Kane C, Koelle B, Moufouma-Okia W, Padgham J, Ranger N, Roux J-P, Suarez P, Tanner T, Vincent K (2015) Ensuring climate information guides long-term development. *Nat Clim Chang* 5(9):812–814. <https://doi.org/10.1038/nclimate2701>
- Kalaba FK, Quinn CH, Dougill AJ (2014) Policy coherence and interplay between Zambia's forestry, energy, agricultural and climate change policies and multilateral environmental agreements. *Int Environ Agreements: Polit, Law Econ* 14(2):181–198. <https://doi.org/10.1007/s10784-013-9236-z>
- Massey E, Biesbroek R, Huitema D (2014) Climate policy innovation: the adoption and diffusion of adaptation policies across Europe. *Glob Environ Chang* 29:434–443. <https://doi.org/10.1016/j.gloenvcha.2014.09.002>
- Niang I, Ruppel OC, Abdrabo MA, Essel A, Lennard C, Padgham J, Urquhart P (2014) Africa. In: Barros VR, Field CB, Dokken DJ, Mastrandrea MD, Mach KJ, Bilir TE, Chatterjee M, Ebi KL, Estrada YO, Genova RC, Girma B, Kissel ES, Levy AN, MacCracken S, Mastrandrea PR, White LL (eds) *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part B: Regional Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp 1199–1265
- Nilsson M, Griggs D, Visbeck M (2016) Map the interactions between sustainable development goals. *Nature* 534(7607):320–322. <https://doi.org/10.1038/534320a>
- OECD (2004) Institutional approaches to policy coherence for development. *A Comparative Analysis of Institutional Mechanisms to*

- Promote Policy Coherence for Development. OECD Policy Workshop, 41–19 May 2004. Available at: <http://www.oecd.org/development/pcd/31659769.pdf>
- Pelling M, O'Brien K, Matyas D (2015) Adaptation and transformation. *Clim Chang* 133(1):113–127. <https://doi.org/10.1007/s10584-014-1303-0>
- SADC (Southern Africa Development Community) (2012) SADC Facts and Figures. Available at: <http://www.sadc.int/about-sadc/overview/sadc-facts-figures/>
- Stemler S (2001) An overview of content analysis. *Pract Assess, Res Eval* 7(17):1–6
- Stringer LC, Mkwambisi DD, Dougill AJ, Dyer JC (2010) Adaptation to climate change and desertification: perspectives from national policy and autonomous practice in Malawi. *Clim Dev* 2(2):145–160. <https://doi.org/10.3763/cdev.2010.0042>
- Stringer LC, Dougill AJ, Mkwambisi DD, Dyer JC, Kalaba FK, Mngoli M (2012) Challenges and opportunities for carbon management in Malawi and Zambia. *Carbon Manage* 3(2):159–173. <https://doi.org/10.4155/cmt.12.14>
- Stringer LC, Dougill AJ, Dyer JC, Vincent K, Fritzsche F, Leventon J, Falcao MP, Manyakaidze P, Syampungani S, Powell P, Kalaba G (2014) Advancing climate compatible development: lessons from southern Africa. *Reg Environ Chang* 14(2):713–725. <https://doi.org/10.1007/s10113-013-0533-4>
- UN (2015) Transforming our World: The 2030 Agenda for Sustainable Development. Available at: https://www.un.org/pga/wp-content/uploads/sites/3/2015/08/120815_outcome-document-of-Summit-for-adoption-of-the-post-2015-development-agenda.pdf
- UN (2016) General Assembly Takes Action on Second Committee Reports by Adopting 37 Texts. Available at: <https://www.un.org/press/en/2016/ga11880.doc.htm>
- UNECA (2011) Vulnerability and climate change hot spots in Africa: mapping based on existing knowledge. United Nations economic Commission for Africa: African climate policy Centre, working paper 2. Available at: http://www1.uneca.org/Portals/acpc/documents/working_papers/WP2-vulnerability%20draft%20v2.pdf
- Urwin K, Jordan A (2008) Does public policy support or undermine climate change adaptation? Exploring policy interplay across different scales of governance. *Glob Environ Chang* 18(1):180–191. <https://doi.org/10.1016/j.gloenvcha.2007.08.002>
- Vincent K, Dougill AJ, Dixon JL, Stringer LC, Cull T (2017) Enhancing climate services for national planning in sub-Saharan Africa: lessons from Malawi. *Clim Pol* 17(2):189–202. <https://doi.org/10.1080/14693062.2015.1075374>