

Exploring mobility and resilience in the context of climatically
driven environmental change: a case study of migration in Anhui
Province, China

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Abstract

This thesis explores links between mobility and resilience in the context of climatically driven environmental change. Using two villages in Anhui Province, China as a comparative case study, this paper investigates the impact of two types of climatically driven environmental change (a flood and a drought) with a specific focus on the role of mobility. The study employs a novel conceptual framework that uses an adapted version of Leach et al's (1999) 'Environmental Entitlements Framework' to understand the processes, characteristics and outputs that contribute to resilience at different levels of analysis. Through the use of this novel conceptual approach, issues of power and social heterogeneity are explored within a resilience framing, the lack of which is a common criticism of many existing resilience studies.

The analysis reveals that, for both communities, those who elected to stay tended to exhibit more resilience than those who were obliged to stay, highlighting the important roles that immobility and choice play in relation to resilience. Significant tension was found between resilience and wellbeing; increases in levels of resilience did not always appear to correspond to increases in wellbeing. The research also reveals interesting inter and intra level interactions between individuals of the same household and between households and the village that threatens the very existence of the villages themselves. The thesis concludes by highlighting the importance of (im)mobility and choice as important influences on resilience, urging for a more critical and cautious use of the concept of resilience with regard to development initiatives and the highlights importance of drawing out interactions between and within different levels of analysis to aid understanding.

Key words: Resilience, adaptation, migration, climate change, China

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1 Introduction

1.1 Mobility, environmental change and resilience

Interest in the impact of anthropogenic climate change on population distributions and migration has grown steadily amongst policy makers, scientists and academics over the past quarter of a century (see, for example, Adger *et al.*, 2014; Baird *et al.*, 2007; Hastrup and Olwig, 2012; Myers, 2002; Stern, 2007; White, 2011). Underpinning this interest is a concern that increased environmental stress (brought about by anthropogenic climate change) will dramatically increase the number of people migrating, potentially threatening regional and global security (Foresight 2011; Gemenne *et al.*, 2014; Gray and Mueller, 2012). However, recent theorising and empirical evidence has revealed a considerably more complex and dynamic picture, challenging the mainstream (and essentially determinist) view (Bardsley and Hugo, 2010; Black *et al.*, 2011a; Oliver-Smith, 2009).

Migration is increasingly recognised as heterogeneous and influenced by a range of drivers that work across spatial and temporal scales (Black, 2011; Collinson, 2011). Empirical studies on the migration environmental change nexus reflect this theoretical drive to explain variation: results can and do pull in different directions. Other factors (social, political, economic, and cultural), operating at a variety of scales are increasingly recognised as significant influences on migration decisions. Despite these obvious cross-scale interactions, synergies and tensions between different levels of analysis are often not explicitly addressed, highlighting the need for interdisciplinary, multi-level research that values local context and specificities (see, for example, Black *et al.*, 2011a; Kniveton *et al.*, 2008; Laczko and Aghazarm, 2009; McLeman and Smit, 2006; Renaud *et al.*, 2011).

Concepts of vulnerability, resilience and their relationship with mobility and migration have become increasingly visible in migration scholarship (a prime example of this is the Foresight Report, 2011). Despite the appeal and widespread use of the concept of resilience, it has been repeatedly critiqued for downplaying politics and power relations (Brown, 2014; Coulthard, 2012; Davidson, 2010; Davoudi *et al.*, 2012; Leach, M. E., 2008; Tanner *et al.*, 2015). The absence of these more social and political elements within resilience theorising have hindered the ability of resilience-framed research to really interrogate the complexities and nuances that mediate adaptation options and peoples' abilities to respond to shocks and stresses (Tanner *et al.*, 2015). To maximise the utility of resilience thinking, novel theoretical approaches are needed that combine resilience concepts with other theories that better represent human agency, power and social difference. One emerging line of research combines resilience with livelihood

approaches and offers, I assert, good potential to critically engage with the issues of mobility and adaptation in a way that better addresses power and politics (Brown and Westaway, 2011; Coulthard, 2012; Ribot, 2014).

Literature on adaptation and adaptation to global environmental change (including climate) has proliferated over the last quarter of a century (see, for example, Adger *et al.*, 2009b; Pelling, 2011; Schipper and Burton, 2009a; Taylor, 2015). As the concept of adaptation has become mainstream, its use has become more complex and diverse ranging from a tightly defined technical term to a broad research field more akin to sustainable development (Pelling, 2011). The emergence of adaptation as a field of enquiry has also seen a deepening association with vulnerability and resilience literature (Adger, 2006; Adger *et al.*, 2003; Agrawal and Perrin., 2009; Osbahr *et al.*, 2008; Paavola, 2008; Pouliotte *et al.*, 2009; Schipper and Burton, 2009b; Smit and Wandel, 2006). This thesis draws on the synergy with vulnerability and resilience literature and frames adaptation within the theories and concepts of these two bodies of work (see section 2.2.2).

Migration serves a variety of purposes and can be, for example, a means to diversify livelihoods, minimise risk or reduce vulnerability to livelihood shocks and stresses as well as an option of last resort (Tacoli, 2009). Despite this knowledge, much thinking still considers migration as 'a problem', a failure to adapt and something to be addressed through practices that encourage people to stay put, to be sedentary (Geiger and Pécoud, 2013). This orthodoxy can be seen in policy approaches and development initiatives where the emphasis often focuses on supporting people to remain *in situ*, to be immobile rather than seeing mobility as a potential avenue to enhance the wellbeing of individuals and communities (Castaldo *et al.*, 2012; Deshingkar, 2006).

A key contribution of the Foresight report (mentioned above) has been to highlight the dangers of immobility as much as mobility for poorer sections of society. To date, research that addresses climatically driven environmental change has tended to focus on what makes people move and much less attention has been paid on the processes and drivers (both environmental and non-environmental) that keep people in place (Morrissey, 2013). Increasing the understanding of these processes not only increases knowledge about trapped and immobile populations but also speaks to the broader debates concerning the relationship between migration, adaptation and development (McLeman and Hunter, 2010; Tacoli, 2009; Tanner and Horn-Phathanothai, 2014).

The primary research is located in China, a country, which has experienced massive changes since 1978 and the beginning of the reform era. Living standards have increased dramatically for almost all sections of society and the country has transitioned from one that is predominantly rural to one with a majority urban population. A key driver of this change has been massive and sustained rural to urban migration. Due, in part, to the large volumes of people moving, migration has been much studied in China yet there has been limited attention to the role of the environment within this body of literature. This is evidenced by the surprising lack of Chinese case studies that address migration in the context of environmental change (see, for example, Foresight, 2011 (and associated Driver Reviews); Hunter, 2005; Laczko and Aghazarm, 2009; and Obokata *et al.*, 2014).

Researching China, especially social change within China, must pay due attention to the unique setting (the politics, institutions, economy for example). In relation to migration, Deshingkar (2005) argues that the diversity of movement patterns is historically, socially and culturally specific. In a similar vein, the influence of the *Hukou* system, as an institutional barrier to mobility, is commonly acknowledged as profound in spite of the reforms over the last 30 or so years (Cai, 2003; Chan, 2011). More generally, the continued importance of other socialist era instruments of state control is a point commonly acknowledged by scholars writing on China including Zhang (2008), Fan (2004) and Chan (2010a). These examples of Chinese institutional uniqueness highlight the need for 'country-specific' research that is able to understand or explain the changes in modern China (Zhang, 2008). In responding to these calls for country-specific research, this thesis has adopted a conceptual approach that enables issues such as the *Hukou* system or other institutional constraints (both formal and informal) to be interrogated (see section 2.4 and also Appendix 4 for a more detailed discussion of the Chinese context).

1.2 Research objectives

The objective of this thesis is to increase understanding of the migration environmental change nexus by exploring the impact of a flood and drought on the behaviour of individuals, households and communities. I explore the ways in which people have coped with and adapted to the impact of these different types of environmental change event and whether mobility was an important feature of this process. This approach conceptualises migration as one possible adaptive response to environmental change (Renaud *et al.*, 2007; Tacoli, 2009) and explores the relationship between mobility and resilience at different levels of analysis (Black *et al.*, 2011b; Black *et al.*, 2011c).

The research uses a novel conceptual framework that synergises resilience and entitlements thinking to understand the processes, characteristics and outputs that contribute to resilience (Nelson *et al.*, 2007). The research focuses on social groups and their differentiated access to resources and the processes through which they are able or unable to convert their resources into an ability to be mobile. Through this exploration of difference power is addressed although the causes and issues underlying this differentiation is not interrogated (Langridge *et al.*, 2006). Specifically, I address the following research question:

Does (im)mobility influence the resilience of individuals, households and communities under conditions of climatically driven environmental change and, if so, how?

I address this question through primary research in two rural villages (Wanzhuang and Dongdian) in Anhui Province, China. Wanzhuang experienced a flood in 2007 and Dongdian has suffered drought-like conditions from 2010 to 2013. These climatic phenomena are selected as they offer an interesting contrast and variation in terms of speed of onset (a drought event is typically categorised as a slow onset event whilst flooding is considerably more rapid) and are likely to engender different (adaptive) responses (Dun and Gemenne, 2008; Renaud *et al.*, 2011). The analysis uses a mixture of quantitative and qualitative data collected over a period of two years from 2011 to 2013.

This research makes a number of important knowledge contributions centred on four issues. First, it responds to the call for more methodologically robust, empirical research that explores the links between climate change and mobility (Bardsley and Hugo, 2010; Kniveton *et al.*, 2008; Van Der Geest *et al.*, 2010). Second, the research contributes to theorising on the migration-climate change nexus through the development of a unique conceptual framework that acknowledges the importance of social differentiation (and, by implication, power) in contributing to mobility and resilience (Langridge *et al.*, 2006) (in so doing it addresses the distinctly ecological bias prevalent in the application of resilience thinking (Ernstson *et al.*, 2010)). Third, and related to the first two points, better understanding of how and when (im)mobility is used generates insight to help probe the relationship between (im)mobility and resilience (Foresight, 2011). Finally, the research examines interactions between different levels of analysis, considered by scholars such as Mauro (2009) and Polsky and Easterling III (2001) to be at the core of environment society relations.

1.3 An overview of the thesis

This thesis is divided into seven chapters. Chapter 2 presents the main issues that pertain to this piece of research, the conceptual framework, the key research gaps and research questions. In Chapter 3, I outline the research methodology and characterise (from a socio-economic and biophysical perspective) the two case study sites. Chapters 4 through 6 present the results of the research addressing the research questions set out in Chapter 2. I finish with a discussion of the main findings and conclusions of the research in Chapter 7. These chapters are outlined in more detail below.

In Chapter 2, I review the literature on migration and environmental change. I argue that the relationship between environmental change and migration is complex with no consistent signal regarding its role in influencing migration behaviour. Furthermore, the links between environmental change and migration are often only postulated limiting the analytical insight of some existing work. At the heart of some of this complexity and uncertainty is the tension between approaches that tend to privilege actors and agency and those that prefer to draw out the importance of structures in influencing behaviour. Bridging this divide, if only slightly could help to generate additional insight and knowledge.

In the remainder of the chapter I present a critical review of resilience thinking and livelihood approaches. I argue that resilience approaches help to shift the focus from a presumption of stability to one of change, surprise and non-linearity and provide a means through which the interdependencies of components between and within levels can be explored. However, the theory of resilience is not without its critics (as touched on above) and has been critiqued, especially for failing to adequately address issues of power and social difference. Livelihoods approaches, specifically, Leach *et al's* (1999) Environmental Entitlements framework, focuses much more explicitly on issues such as social difference and, to a lesser extent, power. Institutions are a key element of the framework, as is the dynamic process through which actors gain access to and use resources. The final section of the chapter synergises these two approaches and sets down the research questions.

Chapter 3 outlines the research methodology used to address the research question and sub-questions presented in Chapter 2. I describe the research design and methods (rapid rural appraisal (RRA), questionnaire survey and semi structured interviews) and analytical approach before characterising the two case study sites. I conclude with a discussion about the main limitations to the research and some of the key ethical issues that I encountered.

Chapter 4 explores the key determinants of mobility at different levels of analysis using data from the household questionnaire, rural appraisal activities and interviews. The chapter characterises the more and less mobile groups within the two case study sites as well as exploring some of the key barriers to mobility. The overall contribution of the chapter is to highlight the complexity of any decision to migrate and the importance of institutions (formal and informal) in influencing who is and is not mobile.

In Chapter 5, I explore the impacts of different types (flood and drought) of climatically driven environmental change on the case study sites showing the main adaptive responses utilised by the inhabitants. Mobility is employed as a response to the environmental change although the picture is messy and complicated. The analysis reveals that more mobile households tend to utilise a different portfolio of adaptation strategies when compared to the immobile, suggesting that mobility broadens the options available when faced with shocks and stresses.

Chapter 6 brings together the output of the previous two chapters and explores the resilience of individuals, households and communities to environmental change. I argue that (im)mobility can be obliged or elected and it is those people and groups that elect or choose to be (im)mobile who appear to be most resilient. However, the focus on specific resilience to environmental change could be at the expense of resilience more generally or to the wellbeing of specific subsets of individuals and households. At the village level, the continued depopulation is threatening the existence of the village revealing important feedbacks between levels.

Chapter 7 summarises the main findings of the thesis and discusses the implications for policies on migration (and related fields) within China and more generally. The chapter also sets out the main contributions of the thesis to research on migration and to resilience literature.

2 Conceptualising migration within the context of environmental change

In the first chapter I introduced some of the key issues that surround the migration environmental change nexus and set out the objectives of the thesis. This chapter builds on the literature I touched upon in the introduction. The first section of the chapter explores the changing ways in which the causes of migration has been understood and theorised by academics (predominantly in the 20th century). In this section, I also address the conceptualisation of migration within climate change literature. Sections two and three present a critical review of scholarly work on resilience and livelihoods, these literatures provide the theoretical bedrock for the thesis. In section four, I bring the two literatures together and present the analytical framework and research questions. In this section, I also highlight the potential of this theoretical framework to contribute to advancing knowledge and understanding of the migration environmental change nexus more generally. I finish the chapter with a brief summary.

2.1 Theorising migration and the environment

2.1.1 Different approaches to theorising the role of environment in migration

Migration first became an issue worthy of study in the developed world in the late 19th and 20th century with the advent of the industrial revolution and the transformation of societies from predominantly rural to urban (see, for example, Ravenstein's (1889) *The Laws of Migration*). Since this early work, the study of migration has diversified to include perspectives from across the social sciences (Brettell and Hollifield, 2000). However, by the mid to late 20th century, political and economic explanations of migration were increasingly dominant and represented two ends of a philosophical and methodological spectrum characterising approaches to the study of migration¹ (Boyle *et al.*, 1998; Pigué *et al.*, 2011).

At one end, theories tended to focus on variations in income across space as driving migration, with the individual regarded as a rational player making informed decisions in perfect market conditions based on actual or expected costs and benefits (Deshingkar, 2005; McLeman and Smit, 2006). In a review of economic theories of migration, Lilleør and Van den Broeck identify three broad groupings. The first grouping is wage differentials between areas (Lewis 1954; Ranis and Fei 1961), the second is expected wage differentials between areas (Todaro 1969; Harris and Todaro 1970),

¹ For a more in depth discussion on key migration theories see Boyle *et al.* (1998: especially Chp 3), Samers (2010: Chps 1 & 2), Massey *et al.* (1998: Chps 1 & 2), and King (2011).

and the third is the New Economics of Labour Migration (NELM) (Mincer 1978; Stark and Levhari 1982; Stark and Bloom 1985; Stark and Lucas 1988). The third grouping stands somewhat apart from the previous two, owing to the conceptualisation of decisions set within a broader household strategy. To these groupings 'Push-Pull' explanations, whilst not a theory in the strictest sense, can also be added: first proposed by Lee (1966) they are considered an 'inseparable companion' to economic explanations and necessary to 'animate their models' (Massey *et al* 1998: 12).

At the other end of the spectrum are the more historical structural approaches that highlight the differences in economic, political and human capital between places that result in flows of labour and capital (Boyle *et al.*, 1998). These approaches (particularly for international migration), rooted within Marxist political economy and world systems theory, emphasise the importance of historical and contextual factors in migratory decisions. Advocates of a more structural approach to migration rejected the primacy of the individual evident in economic theories of migration (Castles and Miller, 2003) and argued that more explanatory power would be gained from understanding the "hidden" logic of the capitalist mode of production' (Boyle *et al.*, 1998: 68). Notable examples of a more structuralist approach to migration include Piore's (1979) dual labour market theory, Shrestha's (1988) structural framework of migration and Wallerstein's (1974; 1979; 1983) world system theory.

At their heart, Marxist structuralist explanations have the notion of uneven development and spatial differences. In Piore's (1979) dual labour market theory the difference is between two sectors within an economy. Shrestha (1988) argues that migration is the result of the increasing penetration of capitalism into the rural sector and concurrent spatial differences between rural and urban centres. Wallerstein (1974; 1979; 1983), in conceptualising the world as one capitalist system, believes that migration is due, in part, to differences between core (such as Europe) and periphery regions (such as Africa).

The rise of the economic and historical structural theories of migration saw a decrease in the prominence of the environment as a driver, becoming progressively less visible through the 20th century (Suhrke, 1993). Hunter (2005) argues that, whilst many classic migration theories provide the foundations to examine the role of the environment within migration decision-making (incorporated as a contextual factor), it is rarely given more than a cursory consideration. This invisibility of the role of the environment in migration frameworks throughout the 20th century is attributed to the rise in the Western-centric belief that technology would diminish the importance of the environment and a paradigmatic shift that favoured more political and economic

explanations over environmental determinism (Piguet *et al.*, 2011). That is not say that the environment was completely invisible and ignored as a contributory factor. Black *et al* (2011c: 435) argue that environmental factors are included in key migration frameworks but tend to be regarded as a contextual consideration.

Both approaches (economic and historical structural) to conceptualising migration have been critiqued as being simplistic and reductionist and overly deterministic (Boyle *et al.*, 1998; Castles and Miller, 2003). In part as a response to the deterministic critique, a number intermediary or pluralist approaches to understanding migration have come to the fore (Greiner and Sakdapolrak, 2013; Samers, 2010) in an attempt to capture more of the complexity and representing what Faist (1997) labels the 'crucial meso level'. These conceptualisations of migration include the NELM (Stark and Bloom, 1985; Stark and Levhari, 1982; Stark and Lucas, 1988), residential mobility decision-making model (Speare *et al.*, 1974), value expectancy model (De Jong and Fawcett, 1981), migrant networks and systems (Fawcett, 1989; Hugo, 1998; Massey *et al.*, 1987; Singer and Massey, 1998), and approaches based on the livelihood framework (Bebbington, 1999; Ellis, 2000; Scoones, 1998).

A common theme running through the approaches outlined above is the desire to embrace the complexity of migration. The approaches often rely on multiple levels of analysis and seek to embed decisions within broader contexts: combining the micro and macro levels of analysis with the household a key site of decision-making and often the primary unit of analysis (Castles and Miller, 2003). Migration was viewed in a more dynamic way and with multiple drivers working across scales (Bakewell, 2010; Bardsley and Hugo, 2010; Castles, 2010; Massey *et al.*, 1998). Underpinning much of this thinking is an increased awareness of the fundamental tension that exists between agency and structure. A key critique of the economic and historical structural approaches is the importance they place on agency and structure respectively, without incorporating the other.

McLaughlin and Dietz (2008: 99-100), in writing about human vulnerability and environmental change, argue that further progress will only be achieved if researchers '...develop a more robust, integrated perspective on vulnerability, one capable of addressing the interrelated dynamics of social structure, human agency and the environment'. Similar points are made by Bakewell (2010) and Obokata *et al.* (2014) who both call for a better integration of agency and structure within conceptualisations of migration. Migration decisions, although made by an individual, are done so within broader social, political and cultural contexts. Privileging the individual over the context or vice versa portrays a very simplistic and incomplete picture of a complex process.

King (2011), in addressing the agency structure dualism within migration research, argues that the application of combined methods and approaches offers a potentially successful means to help ensure a more holistic representation of migration going forward. However, even within this raft of new approaches, the role of the environment has still tended to be excluded from the broader dynamics of migration (Gemenne, 2011).

2.1.2 Putting the environment back into migration

Current interest in the relationship between migration and environmental change can be traced back to the late 1980s and early 1990s and the work of El-Hinnawi (1985), Jacobsen (1988) and Myers (1993; Myers and Kent, 1995). A key reason for the appeal and attention this work received was the doomsday meta-narrative that foresaw millions of people displaced and increasing demands on host countries threatening regional security as a result of an increasingly unpredictable, variable and hostile environment brought about by climate change (Black, 2001). Central to this narrative was an orthodoxy that viewed migration as a failure to adapt and an assumption that exposure to risk would inevitably lead to increased human mobility.

Simplistically, the approach estimates those that are likely to be affected by an environmental hazard and assumes that the entirety of the 'at risk' population would migrate should said event occur. For example, if 100 million people were at risk of a one-meter sea level rise they would all be forced to migrate should that event occur (Brown, 2008; Gemenne, 2011; Gray and Mueller, 2012; Tacoli, 2009). Suhrke (1993), when exploring the links between migration, environmental degradation and social unrest, describes this position as maximalist. Advocates of the maximalist position have a tendency to uncritically attribute the environment as the primary driver for the large numbers of predicted migrants and, implicitly or explicitly, link this issue to regional or global security for the developed world. Climate change is cited as a factor that will exacerbate the situation (see, for example, Homer-Dixon, 1999; or Myers and Kent, 1995).

As a counterpoint to the maximalist perspective described above an increasingly nuanced view of migration has emerged that sees migration as one possible adaptive response to social, political, cultural and environmental change; it is considered an important strategy to reduce vulnerability (Foresight, 2011; Tacoli, 2009). This more nuanced or minimalist (to use Suhrke's (1993) characterisation) view of migration has emerged over the last decade or so and differs from the orthodoxy that considered migration a failure to adapt rather than an adaptive response to environmental or social

change². Indeed, this orthodoxy is pervasive across much development thinking where the emphasis often lies in supporting people to remain where they are rather than seeing migration as means to improve individual and societal wellbeing. This perspective has drawn criticism from, for example, Castle (2010), who describes it as a 'sedentary bias', and Morrissey (2009), who cautions against reifying the sedentary model of human settlement.

Two key messages are worth highlighting from the discussion above. First, and regardless of the conceptualisation of migration as a failure to adapt, a successful strategy or distress migration, understanding the links between migration and what it means for the resilience or vulnerability of social actors in specific circumstances is very important and necessary. Second, the debate concerning migration and development has evolved from one that considered migration as separate to development to one in which migration and development outcomes are increasingly intertwined (although the nature of the relationship is still subject to intense debate) (Black and Sward, 2008; Deshingkar, 2006; Geiger and Pécoud, 2013; Sutherland, 2013).

Examining the evidence for environmental migration

As with developments in migration studies, links between the environment and migration began to be viewed in a more dynamic way, with multiple drivers working at scale and where agency and structure interact and feedback on each on other (Bakewell, 2010; Bardsley and Hugo, 2010; Castles, 2010; Massey *et al.*, 1998). Theorising on migration and the environment is becoming increasingly complex as academics seek to capture the dynamic processes at work and explain context specific variations. Cumulatively, the impact of these developments can be seen in more recent work on migration where the environment is once again considered as one of many drivers influencing the decision-making process (see, for example, Black *et al.*, 2011a; Kniveton *et al.*, 2008; Laczko and Aghazarm, 2009; McLeman and Smit, 2006; Perch-Nielsen *et al.*, 2008; Renaud *et al.*, 2011).

Migration has been found to increase and decrease with environmental change and it can be a proactive choice or an option of last resort once all other options have failed (McLeman, 2010). Furthermore, the use of migration as a precautionary adaptation due to increased perceptions of risk cannot be discounted (Bardsley and Hugo, 2010). Migration may also provide a means through which households spread risk and an

² Migration has also been conceptualised as an option of last resort, a proactive response or risk minimisation technique. For a more in depth discussion of these issues see Barnett and Webber (2010), Laczko and Aghazarm (2009), Renaud *et al* (2011), Tacoli (2009), Brown (2008), Collinson (2011), Stark and Bloom (1985), and Stark and Lucas (1988).

important livelihood strategy (Ellis, 1998). Migration is an incredibly complex process caused by a number of drivers acting at different temporal and spatial scales (McLeman and Smit, 2006). Bardsley and Hugo (2010) argue that it is important to see the relationship between environmental change and population movement in a number of ways to avoid privileging certain types of movements. Furthermore, they argue that mobility is just one possible response among many to environmental change and one (of the many) potential components that contribute to a migration decision.

The discussion above portrays the relationship between the environment and migration as one directional without exploring the more recursive elements through which migration changes the environment. Although this framing of the relationship is common in migration environment research it does not capture the processes through which agents can impinge on the environment (Bonfiglio, 2012). Migration can and does influence the environment in both sending and receiving locations that in turn has the potential to influence the environmental drivers of migration. For example, migration can lead to environmental degradation in receiving locations due to increasing demands on water and other resources causing further migration (Hugo, 2008; Hummel *et al.*, 2013; Hummel *et al.*, 2009). Whilst these feedbacks and linkages are acknowledged and explored to a certain extent within this literature review (and research more generally) the primary focus is on the role of the environment as a driver of migration.

Climate change as a driver of migration

Three types of environmental change event have been commonly used to study the links between climate change and migration: (1) slower onset events such as droughts and desertification, (2) faster onset events such as floods and landslides, and (3) change associated with increasing sea levels such as inundation and salinization (Tacoli, 2009). The environmental changes associated with faster and slower onset events (groups one and two above) have been extensively studied using present day and past analogues. Environmental changes associated with sea-level rise are much less studied using analogues (they are much rarer). Instead these types of events are explored through the identification of at risk groups and inferences about possible impacts and effects. Moving from the abstract to a more specific focus, Table 2-1 (below) summarises some of the major recent studies that explore links between faster and slower onset environmental changes and migration.

Table 2-1: Summary of some recent major studies exploring the links between environmental changes and migration.

Authors	Study area	Method	Type of environmental change	Key findings
Etzold <i>et al.</i> (2013)	Bangladesh	Mixed methods approach using interviews and questionnaires with a focus on several villages	Rainfall variability and food insecurity (SLOW / VARIABILITY)	Migration not driven by climatic variability but existing livelihood and labour market systems. Impacts and migration socially contingent.
Dun (2011)	Vietnam	Mixed methods approach using interviews and questionnaires with a focus on one region	Flooding in the Mekong delta (RAPID)	Flooding triggers seasonal labour migration, can cause disruptions for those directly dependent on the environment (particularly those repeatedly affected) leading to migration by individuals and households and is also a cause for government led resettlement initiatives
Gray and Mueller (2012)	Bangladesh	Quantitative approach using longitudinal (three waves in 1994, 2003 and 2006) panel survey data for 1,700 households covering up to 47 communities in rural Bangladesh	Flooding (severity of), crop failure and long-term mobility (RAPID)	Exposure to disaster did not have consistently positive impact on migration. Migration is used as a coping strategy but not universally. The impact of flooding is not as large as the impact of crop failures on migration
Fussell <i>et al.</i> (2014)	US	Place-based migration systems approach to migration, exploring existence and magnitude of county to county flows following hazard event	Impact of Hurricane Katrina on New Orleans (RAPID)	Focused on recovery migration and found that it is a combination of returning and new residents. Post-disaster ties with spatially proximate counties increased.
Feng <i>et al.</i> (2010)	Mexico - US	Quantitative instrumental variables approach exploring links between climatic variability, crop yield and emigration in Mexico for two five year time periods	Focus on corn and wheat yields for all states in Mexico during drought years (SLOW)	Find that decreases in crop (corn or wheat) yield (associated with climate variability) increases the fraction of population emigrating

Table 2.1 (cont.): Summary of some recent major studies exploring the links between environmental changes and migration.

Authors	Study area	Method	Type of environmental change	Key findings
Feng <i>et al.</i> (2011)	US	Quantitative instrumental variables approach exploring links between climatic variability, crop yield and emigration at a county level from 1970 to 2009	Focus on corn and soybean yield losses associated with variability in weather for counties in Midwestern states and Kentucky and (SLOW / VARIABILITY)	Find a relationship between decreasing yield and increases in out-migration for the adult population
Doevenspeck (2011)	Benin	Mixed methods approach using interviews and questionnaires with a focus on one region over a period of 5 years	Focus on drivers of migration (SLOW)	Environmental degradation not sufficient to explain migration in rural Benin. Migration is a social process, different people respond in different ways when presented with threats and opportunities
Henry <i>et al.</i> (2003); Henry <i>et al.</i> (2004)	Burkina Faso	Quantitative approach using a multi level event history analysis. Data drawn from nationally representative sample and retrospective community surveys	Focus on the causes of the first out-migration of adults over the age of 15 (SLOW)	In ecologically marginal zones environmental variables had greater explanatory power than socio-demographic variables. Nationally, the impact of environmental variables was considerably less powerful.
Ezra and Kiros (2001)	Ethiopia	Multilevel event history analysis for a 10-year period. Data drawn from a household survey in rural areas	Focus on causes of out migration during drought years (SLOW)	Life course events found to be very important in determining migration. At a community level vulnerability to food crises also had a positive affect on migration
Findley (1994)	Mali	Quantitative approach using longitudinal panel data (two cohorts in 1982 and 1989) for 99 villages in first region of Mali (Upper Senegal River Valley)	Focus on the causes of migration during the drought years of 1983 – 1985 (SLOW)	Level of overall migration for the region did not rise. There was an increase in the numbers of women and children migrating and a shift to shorter cycle patterns of migration

Focusing solely on the studies in Table 2-1 that look at the impacts of drought provides an example of the often-contradictory nature of the relationship between the environment and migration. Ezra and Kiros (2001), in their study in Ethiopia, find that life course events (such as school and marriage) at an individual level and vulnerability of the community to food crises at a community level are both significant determinants of migration. Henry and colleagues (2003; 2004) were interested in the impact of drought on interprovincial migration in Burkina Faso. They found that the explanatory power of environmental variables was significant when examining migration from ecologically marginal provinces with rainfall, land degradation and land availability all representing significant push factors. However, when exploring the impact of changing rainfall patterns on the first out migration of adults, life course events were found to be much more important, echoing the findings of Ezra and Kiros. Findley (1994), when examining the impact of drought in Mali, found that, overall, the level of migration within the region of study remained constant, although its character changed significantly; shorter, circular migration increased (especially amongst women and children) whilst longer, permanent migration remained static. Lastly, Doevenspeck reported that environmental changes were not sufficient to explain the patterns of migration in rural Benin. He concluded that social, political and cultural contexts were very important in explaining the different patterns of movement.

Drawing on all of the examples in Table 2-1, five general points can be made. First, environmental change tends to be investigated through disruptions to the resource base and associated impact on livelihoods or through the disruption to lives associated with the event itself. Second, the relationships between environmental change and migration are complex with no consistent signal regarding the role of the environment; empirical results can and do pull in different directions. Third, the actual pathways through which the environment manifests itself on migration are often only postulated, limiting the analytical and explanatory power of the studies (this is especially the case for the more quantitative approaches). Fourth, the studies also highlight the importance of social, historical and political contexts and their influence on migration patterns and decisions. Acknowledging and capturing this potentially complex range of factors requires novel theoretical approaches and robust methodologies. Finally, there are few examples of studies in the English-speaking world that examine the relationship between the environment and migration in China (Tan and Guo, 2007). Of the studies that do exist, most tend to focus on resettlement programmes (CEDEM, 2009; Li *et al.*, 2013; Tan, 2011; Tan *et al.*, 2013) and a minority focus on the impact on the environment as a result of migration (in sending or receiving locations) (Hao *et al.*, 2013; Qin, 2010; Song *et al.*, 2008).

At a more abstract level, an additional observation concerning the issue of scale is also worthy of note. Research on the migration environmental change nexus tends to fracture along lines of scale (mirroring to a certain extent the earlier discussion concerning the agency structure dichotomy). On the one hand, intensive case studies are employed to focus on a set of individuals, households or communities with the intention of establishing how they are responding to a change in circumstances and on the other, extensive approaches focus on regional surveys to identify risk and hence vulnerability (Gemenne, 2011; Piguet, 2010). Scale is important in informing what and how research is framed, implemented and the conclusions that are drawn; yet it is rarely problematized (Adger *et al.*, 2009a; Birkenholtz, 2011) (see sections 3.1 and 3.2.2 (Spatial and Temporal research issues) for further details on how this issue has been addressed in this research).

Migration is an event or process that works across both temporal and spatial scales and doesn't fit neatly into predefined categories. This is especially the case when one considers migration in the context of climate change where the validity and utility of single scale explanations has been questioned (Neumann, 2009; Polsky and Easterling III, 2001). Indeed Engel di-Mauro (2009) argues that issues of scale are often at the core of explanations for people environment interactions. Developing this analysis further Sayre asserts that scale is not about size but links (specifically processes and relationships) and argues that this necessitates cross-scale and interdisciplinary research (2005). This is a call echoed by other scholars working in the field of migration studies (Adger *et al.*, 2009a; Black *et al.*, 2011b; Castles, 2010; Curran, 2002; Kniveton *et al.*, 2008).

In this section I have summarised some of the key developments in migration theorising (predominantly in the 20th century) highlighting the dominance of historical structural and economic models of migration. More recently, theorising on migration and the migration environmental change nexus has increased in complexity mirroring developments across the social sciences. Although limited, empirical work on the migration environmental change nexus has revealed a complex picture with results often pulling in different directions. Contextual social, economic and political factors are found to be as important (if not more so on occasions), emphasising the importance of an interdisciplinary, multi level approach to empirical work. In the next two sections I introduce two broad theoretical approaches to understand human environment relationships and interactions: resilience and entitlements approaches.

2.2 Resilience of social-ecological systems

2.2.1 Resilience and social ecological systems

The concept of resilience was first introduced in the 1970s in the field of ecology as a way to understand non-linear dynamics and the means by which ecosystems are able to maintain themselves during periods of change or perturbation (Berkes *et al.*, 2003). Within ecology, resilience has been defined in two different ways: 'engineered resilience' and 'ecological resilience'. Engineered resilience is commonly conceived of as return time or the time required for a system to return to equilibrium following a disturbance. Ecological resilience is defined as 'the magnitude of disturbance that can be absorbed before the system changes its structure by changing the variables and processes that control behaviour (Holling and Gunderson, 2002: 28). Ecological resilience rejects ideas of determinism, predictability, and mechanistic properties implied in engineered resilience, highlighting instead heterogeneity, surprise, and self-organisation (Folke, 2006; Folke *et al.*, 2010). Carpenter *et al.* (2001) argue that engineered resilience focuses on the ability of a system to resist a disturbance whereas the ecological definition focuses on the ability of a system to persist³. This crucial difference, between resistance and persistence, helps to shift attention from the overarching paradigm of stability towards something more dynamic (Adger, 2003).

A key attribute of the resilience approach is to change the focus from an assumption of stability to one of stability *and flexibility* (my emphasis) (Davidson, 2010). The duality of stability and flexibility is conceptualised through basins of attraction, stability domains or multiple stable states⁴. A system can flip to an alternative state as a result of an external perturbation or internal dynamics that moves the system beyond a certain threshold (Folke *et al.*, 2010). Once this threshold has been reached the system changes into a new state, recovering to the previous state is often very difficult. Oft-cited examples include collapse of the cod fishery in the Northwest Atlantic (MEA, 2005) and lake eutrophication resulting in turbidity (Carpenter *et al.*, 2001). Resilience thinking is framed within the idea of complex adaptive systems, these systems are defined by non-linearity, aggregation, diversity and flows that generate path dependencies giving rise to multiple possible basins of attraction (Folke, 2006; Folke *et al.*, 2010). The greater a system's resilience the harder it is for it to change into a fundamentally new state.

³ Despite drawing a specific distinction between resilience and resistance Carpenter *et al.* (2001) highlight that, to study persistence, one should also consider resistance as a linked attribute of resilience.

⁴ For a detailed discussion of these terms please refer to Resilience Alliance (2014b) and Walker *et al.* (2004). For my purposes, from this point forward, I use the term 'basins of attraction'.

The idea of resilience has been extended to the social domain⁵. Adger (2000: 347) defines social resilience as ‘the ability of groups or communities to cope with external stresses and disturbances as a result of social, political and environmental change’. Adger (*ibid*) argues that, through social resilience, groups and communities are able to adapt to environmental changes (they are resilient). Crucially, the definition and subsequent explanation emphasises that social and ecological resilience are linked in some way, framed within a social ecological system⁶. Humans and nature are not seen as merely interdependent systems but one in the same system with cultural, political, technological, social, economic and ecological components interacting (Adger, 2003; Resilience Alliance, 2010; Resilience Alliance, 2014a).

The broadening conceptualisation of social-ecological systems resulted in a synthesised version of the ecological definition of resilience:

- 1) the amount of change the system can undergo and still remain in the same state (the same controls on structure and function);
- 2) the capacity to self-organise⁷; and
- 3) the capacity to adapt and learn (Carpenter *et al.*, 2001).

The application of resilience set within a social-ecological system framing has a number of potential benefits. First, taking a systems approach enables problems to be framed holistically and solutions to be identified in an integrated manner. Shocks and stresses are often covariant affecting different parts of the system in distinct but related ways; the system focus provides a conceptual framework through which these interdependencies can be revealed. Second, issues associated with trade-offs and synergies and temporal and spatial interactions at scale can be made explicit all set within specific cultural and historical contexts. Third, the focus on social and ecological attributes highlights the dependencies and risks of communities more dependent on natural resources (Adger, 2000; Beichler *et al.*, 2014; Béné *et al.*, 2014; Goulden, 2006; Keck and Sakdapolrak, 2013).

2.2.2 Locating the actor within a resilience framing

The purpose of the following discussion is not to review the evolution of the terms or draw out the differences in meanings across the different fields of study; this is dealt

⁵ Although, both Miller *et al.* (2010) and Davoudi *et al.* (2012) (amongst others) caution that that resilience should not be uncritically transferred from its natural science roots to the social sciences (discussed subsequently in section 2.2.3).

⁶ For the remainder of this thesis I will refer to linked social ecological systems as social-ecological systems.

⁷ Understood to be the extent to which ‘reorganization is endogenous rather than forced by external drivers’ (Carpenter *et al.*, 2001: 765).

with extensively in existing literature (see Adger, 2006; Folke, 2006; Gallopín, 2006; Martin-Breen and Anderies, 2011; Walker *et al.*, 2006; Walker *et al.*, 2004 for example). Rather, I wish to highlight that the concept(s) of adaptation (and adaptive capacity) provide(s) a means to bridge the divide between actor and system approaches and, at a more fundamental level, issues of agency and structure.

Vulnerability⁸ and resilience literature both acknowledge the very close relationship between vulnerability, resilience, adaptation and adaptive capacity. Smit and Wandel (2006: 282) state that the concepts of '*adaptation, adaptive capacity, vulnerability, resilience, exposure and sensitivity* are interrelated and have wide applicability [emphasis in the original]'. Similarly, Gallopín (2006: 301) argues that the 'concepts of vulnerability, resilience, and adaptive capacity ... are related in non-trivial ways. Resilience literature, while tending not to focus on the concept of vulnerability, does highlight the close links between resilience, adaptability, adaptive capacity, and vulnerability.

For example, Miller *et al.* (2010: 1) states that '[r]esilience and vulnerability, as well as the related concepts of adaptation and transformation, are central concepts in highly influential but somewhat different ways of framing our analysis of social–ecological change'. The connections between the different concepts highlighted by Miller and colleagues is also apparent in the paper by Folke (2006: 262). He states that, '[a] vulnerable social-ecological system has lost resilience. Losing resilience implies loss of adaptability. Adaptability in a resilience framework does not only imply adaptive capacity to respond to the social domain but also to respond to and shape ecosystem dynamics'. These quotes highlight the close relationship between the concepts, specifically the central role that adaptation plays in both resilience and vulnerability literature (Coulthard, 2012).

Within resilience literature, adaptability describes the processes through which a system is able to use knowledge and experience, adjust behaviour and modes of operating in response to external or internal processes to continue to exist within a current stability domain. Specifically, adaptability is defined as 'the capacity of actors in a system to influence resilience' and is predicated on the notion that systems are in a state of flux rather than stasis (Walker *et al.*, 2004: 1). Resilience and adaptability are closely linked and relate to the dynamics of a specific system (Walker *et al.*, 2004). The concept of adaptation, as approached from a vulnerability perspective, is derived from a broader disciplinary field compared to that of resilience including hazard research,

⁸ Describes a body of literature that tends to focus on the actor and draws strongly (but not exclusively) on more constructivist traditions (Miller *et al.*, 2010). This body of work has also been labelled by Nelson *et al.* (2007) as 'environmental change literature and 'entitlements and livelihoods approaches' by Ribot (2014).

political ecology, human ecology, political economy, constructionism and entitlements (Adger, 2006; Miller *et al.*, 2010). Adaptation is defined as the 'adjustment in ecological, social, or economic systems in response to observed or expected changes in environmental stimuli and their effects and impacts in order to alleviate adverse impacts of change' (Nelson *et al.*, 2007: 398).

Notwithstanding the similarity in definitions, a major difference in the two literatures is the focal scale of analysis. In the vulnerability literature, the unit of analysis (be it a catchment, economic sector, household or individual) is the focal point of interest rather than the system and the relationship between its component parts. Within the analysis, the role of the broader political economy of resource use, that is the historical, social, political and economic contingencies in structuring vulnerability or adaptation are more likely to be examined. Issues such as power, access and entitlements as well as the agency of actors are commonly addressed (Adger, 2006; Nelson *et al.*, 2007; Smit and Wandel, 2006). In resilience literature (as outlined in section 2.2.1 above), the system is the focus of the analysis and the interactions between the component parts is more normally of interest. Underpinning these differences is the dialectic between the actor and the system; vulnerability literature tends to take an actor-orientated approach compared to the systems-orientated approach of resilience literature (Miller *et al.*, 2010).

Although there is much common ground and widely recognised benefits of increased levels of dialogue between the approaches, the two communities (resilience and vulnerability) have remained distinct. Adger (2006) refers to the joint challenge of consilience, the interlocking of explanations of cause and effect between disciplines, a point echoed by Miller *et al.* (2010). At a slightly more abstract level, a number of academics have highlighted the need for an increased focus on conceptual approaches that are able to address the twin concepts of agency and structure within the context of global environmental change (more generally) and within resilience thinking (more specifically) (Armitage *et al.*, 2012; Brown and Westaway, 2011; Coulthard, 2012; Davidson, 2010; Dwiartama and Rosin, 2014; Turner II, 2010). The recent interest in more closely integrating issues of agency and structure within environmental change literature is also evident in contemporaneous theorising on migration (see previous section). In both cases the goal is more insight and greater explanatory power within the theoretical bodies of work.

The conceptualisation of adaptation within the vulnerability literature is the ability (or otherwise) of actors to take decisions and implement them (Nelson *et al.*, 2007). Such notions are also implicit in many of the definitions of adaptation in resilience literature

(see, for example, Carpenter *et al.*, 2001; Gallopín, 2006; Walker *et al.*, 2004). Brown and Westaway (2011) argue that adaptive capacity can be seen to correspond to resources, agency and structure. As such, adaptation and adaptive capacity can act as a bridging concept between different (actor and system) approaches, providing an ideal conceptual vehicle to try to engage different disciplinary strands in attempts to generate the consilience that Adger (2006) calls for (see also Berkes and Ross, 2013; and symposium report by Leach, M., 2008).

2.2.3 Resilience for whom?

Social-ecological systems sometimes get locked in very resilient but undesirable regimes, examples of such regimes include poverty or states that decrease social welfare (Carpenter *et al.*, 2001). In such circumstances, it may be considered expedient to transform the system state to something more desirable. Transformability is the 'capacity to create a fundamentally new system when ecological, economic, or social structures make the existing system untenable' (Walker *et al.*, 2004: 1). Whereas resilience and adaptation focus on managing change to maintain essentially the same system structure and function, transformation implies something more fundamental. Although, as Walker *et al.* (2004: 2) state, the dividing line between adaptation and transformation can be 'fuzzy, and subject to interpretation'. Within resilience literature these states are the basins of attraction mentioned earlier.

I wish to make two specific comments regarding the concept of transformation before making a more general observation about the way in which issues of power and social difference have been addressed within resilience thinking. First, moving between basins of attraction introduces the ideas of intentionality and desirability. Variability is a fundamental aspect of any system and, over time, change to different states is inevitable. Transformational change can be deliberate or forced by changing environmental and socio-economic circumstances (relates to the issue of agency discussed in section 2.1.1 above) (Folke *et al.*, 2010). From a societal perspective, certain states will be more or less desirable dependent on their perceived costs and benefits. Furthermore, different actors can and do have different perspectives on the relative merits of the same state.

Resilience describes properties of a system, in its pure sense it is not normative. Yet this apparent neutrality masks many normative elements that characterise social (and political) systems. Defining what constitutes a desirable system and for whom requires normative judgements that tend not to be addressed within resilience thinking (see for example the plenary debate between Rockström and Leach, 2014 at the Resilience Conference in Montpellier). Within resilience literature, outcomes are often presented

as desirable or natural with an assumed consensus (Brown, 2014; Davoudi *et al.*, 2012). Cote and Nightingale (2012: 479) make the important point that the application of ecological principles within the social realm has reduced opportunities to ask important normative questions such as “resilience of what?” and “for whom?”

The second, related point is the issue of bounding (see section 3.2.2 below on bounding the research and site selection). In choosing the focal point of the study, in identifying the system, some things are included whilst others are, inevitably, excluded (Davoudi *et al.*, 2012). Whilst the system may be reasonably self-evident in ecological terms (a river catchment, a lake, or a population of monkey) the choice is that much more difficult and more normative for open social-ecological systems (Turner, 2014). Cote and Nightingale (2012: 484-485) state that resilience thinking ‘is a power-laden framing that creates certain windows of visibility on the processes of change, while obscuring others’. Indeed, the choice of scale or focal point for the analysis is vital in determining the identification of system variables, processes of change, perceptions and choices about the desirability of system configurations and management approaches (Armitage *et al.*, 2012).

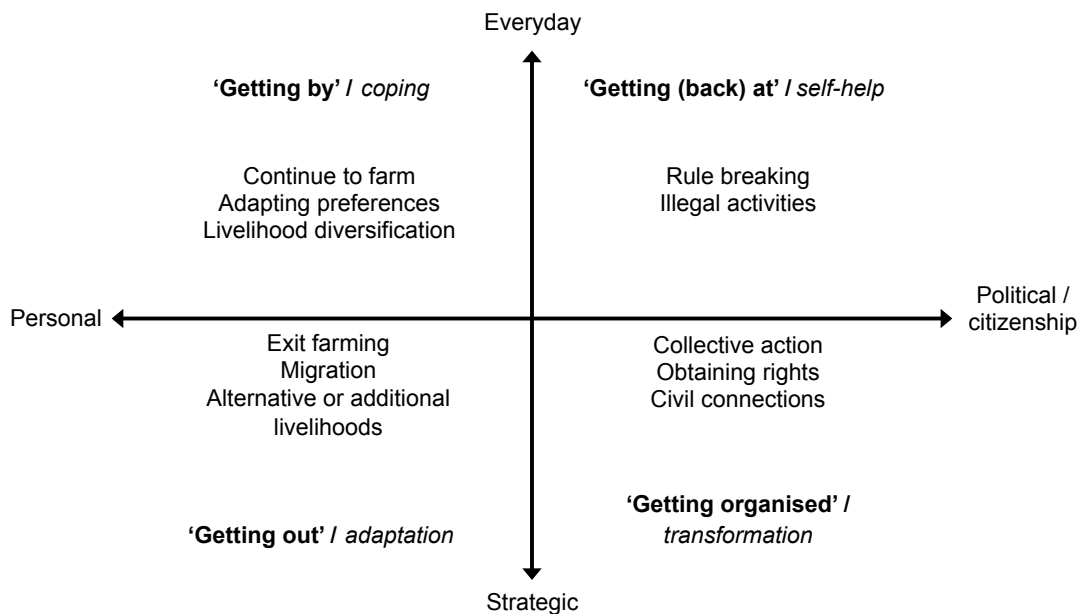
Underpinning both of the points made above is the relative inability of resilience frameworks to address the issue of power. Davoudi *et al.* (2012) describes resilience as ‘power-blind’ and Berkes and Ross (2013) refer to the ‘relative silence’ in regard to issues of power. Similarly, Davidson (2010: 1135) asserts that resilience theory ‘is not readily applicable to social systems’. In making her argument, Davidson highlights the unequal nature of human agency bringing to the fore issues of social difference and questions concerning who has (has not got) access to what and why? At the heart of the matter is the systems focus that tends to exclude more local explanations centred upon individual actors and agency (Nelson *et al.*, 2007). This arises from the abstraction of political and economic issues from social and ecological processes and limits the explanatory power of the theory.

In response to such critiques, recent developments in resilience thinking have sought to integrate resilience with other theoretical approaches to address the shortcoming (Brown, 2014). Examples include the interplay of resilience and wellbeing (Armitage *et al.*, 2012; Coulthard, 2012), adaptation (in a more actor-orientated approach) and vulnerability (Béné *et al.*, 2011; Davoudi *et al.*, 2012; Miller *et al.*, 2010; Nelson *et al.*, 2007; Shaw *et al.*, 2014), access (Langridge *et al.*, 2006), actor network theory (Dwiartama and Rosin, 2014), as an explicitly social concept (Marshall and Marshall, 2007) and with political ecology approaches (Peterson, 2000). These theoretical advances suggest that considerable potential does exist to broaden the scope of

resilience approaches to more explicitly deal with some of the normative and power issues associated with the more social of social sciences.

Of the recent developments outlined above, one of the most illuminating examples is provided by Sarah Coulthard (Coulthard, 2012) who draws on work by Ruth Lister to explore decision-making processes around adaptation. In her article, Coulthard draws out the four dimensions of agency (from everyday and personal to political / citizenship and strategic) identified by Lister and applies them in a fisheries context to explore resilience and wellbeing through the twin concepts of adaptation and transformation⁹ (Figure 2-1).

Figure 2-1: Different possible responses to livelihood shocks and stresses for people living in poverty set against two axes representing different forms of agency. Adapted work of Lister (2004:130) in Coulthard (2012) and Brown and Westaway (2011).



In a similar vein, Brown and Westaway (2011: 336) argue that an application of Lister's Agency taxonomy could provide useful insight into the 'distinctions and linkages between coping, adaptation and transformation'. Both papers make the useful conceptual point that these approaches can help bridge the divide between the more system orientated approaches of social-ecological systems and the more actor orientated approaches inherent within adaptation and vulnerability studies.

Whilst similar, the two papers do appear somewhat blurred (perhaps intentionally) on the division between an adaptation strategy and transformation. Coulthard states that

⁹ Although the extent to which the actions listed are demonstrating agency as opposed to choices or strategies within existing structures is debatable (see, for example, the discussions on agency in Jackson, 1998; Jackson, 1999; McLaughlin and Dietz, 2008).

migrating to a new area can be considered as transformative owing to the change in the structure and function of a person's livelihood. However, at a later point in the text, she refers to 'Getting out' as an adaptation strategy. Brown and Westaway, imply in their adapted version of Lister's typology that 'Getting out' is a form of adaptation rather than transformation. Yet, in both articles, the division between the two types of change is not clear and is an issue highlighted for future research. For example, Brown and Westaway (2011: 337) pose the question, '[h]ow is transformative capacity distinguished from adaptive capacity and coping with regard to agency?'

The precise reason for the fuzziness in identifying the differences between adaptability and transformation is suggestive of a lack of conceptual clarity regarding the distinction between the two concepts; a concern that I also share and one acknowledged by Walker *et al* (2004: 2). Certainly, some of the difference is likely to be explained by the focal point of the system under study. For example if the focus was on the wellbeing of the individual then migrating could be considered an adaptive response. Conversely, if the livelihood were the focal point then the adoption of a new livelihood arising from migrating would be considered a transformation emphasising the importance of how the research is framed in influencing the types of issues considered important. Furthermore, the conceptual fuzziness suggests that utility of the two terms and the explanatory power they bring within literature exploring resilience in social settings is not a given. This suggests that a closer and more critical assessment of the relative merits of adaptability and transformation could be a worthwhile endeavour.

The work by Coulthard and Brown and Westaway mirrors my own attempts to place agency more centrally within resilience thinking and is a key reason for my choice of analytical framework (and focus on adaptation in Chapter 5 below). The analytical framing that I have adopted addresses the issue of agency by placing actors at the centre of the framework and exploring how they are able to utilise their differentiated access to resources to be more or less mobile (through endowments and entitlements) and the impact this has on their specified resilience.

In summary, this section has described the theory of resilience and some of the key concepts that are commonly used. Resilience is categorised as the amount of change a system can experience whilst retaining the same function and structure, the degree to which the system can self-organise and the degree to which a system can learn and adapt (Carpenter *et al.*, 2001; Walker *et al.*, 2009; Walker *et al.*, 2006). Adaptability or adaptive capacity is acknowledged as a key aspect of a resilient system or individual (see discussion above) and reflects a system's ability to learn and respond to external or internal dynamics (Adger and Kelly, 1999; Folke *et al.*, 2010; Gallopín, 2006;

Gunderson *et al.*, 2006; Nelson *et al.*, 2007; Smit and Wandel, 2006; Walker *et al.*, 2009; Walker *et al.*, 2004). Transformability, in contrast has been defined as the ability to create a fundamentally new system when existing economic, social or ecological changes make the current system untenable (Folke *et al.*, 2010; Gunderson *et al.*, 2006; Walker *et al.*, 2009; Walker *et al.*, 2004). Adaptability and transformability both capture change within a system. The two terms are related but differ in the amount of change they represent. Adaptability captures the changes and adjustments that social components of the system make to remain in the same basin of attraction.

Transformability refers to a change that creates a fundamentally new system structure and function. Systems can be transformed either intentionally or unintentionally through recognition of past failures or through changing social values for example (such as the abolition of slavery). This intentionality is key in understanding resilience during periods of transformation: if change is intentional a system is resilient, if change is unintentional a system has lost resilience.

I propose that a resilience lens has a number of advantages when undertaking research on social and ecological issues, not least the ability to conceive of problems in a holistic manner (that considers both environmental change and social issues). Furthermore, the focus on integrated social and ecological systems permits the incorporation of human elements within the system dynamics (although this is not without criticism) that cannot be viewed in isolation but need to be considered in relation to each other (Nelson *et al.*, 2007). However, the systems approach has been critiqued for failing to adequately address issues of power and social difference. Despite this, a resilience lens does appear to offer good potential and levels of explanatory power especially if combined with other frameworks that address some of the shortcomings of a resilience approach. Adaptability and adaptive capacity provide a useful conceptual vehicle through which a resilience framing can be combined with other more actor-orientated approaches that foregrounds the issue social difference and, to a certain extent, power. In the next section I discuss livelihood approaches with specific reference to the Environmental Entitlements framework before going on to discuss the synergies between it and resilience.

2.3 Livelihoods approaches

Livelihood approaches, common in the field of development studies, have wide applicability for studies relating to climate variability and adaptation. Livelihoods approaches place the actor at the centre of the analysis and focus on the experiences of the lived world with specific regard to issues of poverty, vulnerability and marginalisation. Understanding complex local realities, help, it is argued, to break down

artificial categories and silos that tend to exist between and across academic disciplines. Within this approach the household was frequently the focal point of analysis (De Haan and Zoomers, 2005; Scoones, 2009).

In 1992, Chambers and Conway published a working paper for the Institute of Development Studies that is widely considered to mark the starting point of the 'sustainable livelihoods approach' (Scoones, 2009). The emergence and subsequent development of livelihood approaches (see, for example, Allison and Ellis, 2001; Bebbington, 1999; Carney, 1998; Ellis, 2000; Scoones, 1998) can be viewed as a reaction to the more Marxist and structural perspectives that were dominant in the 1970s and 1980s and the Washington consensus that was prevalent in late 1990s and early 2000s. Livelihood studies emphasised agency and potential over impoverishment and owed much to the work (amongst others) of Sen (1981; 1984) on entitlements and Chambers (1983) on participation and rural development (De Haan and Zoomers, 2005; Scoones, 2009).

Carney defined a livelihood (1998: 2) as:

[T]he capabilities, assets (including both material and social resources) and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its capability and assets both now and in the future, while not undermining the natural resource base.

Within this context the multiplicity of livelihood activities were captured, a key strength of the approach. Furthermore, livelihood analysis incorporated mediating factors by seeking to address how access to resources was modified and the broader context within which this occurred. Specifically, the modifiers were disaggregated into two groups: one related to access and the other to the broader context. The access group included social relations (gender, class, age, and ethnicity), institutions (rules and customs, land tenure, and markets), and organisations (associations, NGOs, local administrations, and state agencies). The context group included trends (population, migration, technological change, prices, macro policy, and economic trends) and shocks (storms, recruitment failures, diseases, and civil war). Within the context group changes in environmental conditions such as floods and droughts fit under the shocks category whilst longer term changes to environmental conditions are located in the trends category (Allison and Ellis, 2001; Ellis, 2000).

The use of assets and capacities within livelihood approaches emphasised the potential of people and their ability to seize opportunities and influence their

surroundings. In so doing, livelihood scholars stressed more non-material elements. For example, Bebbington (1999: 2022) states

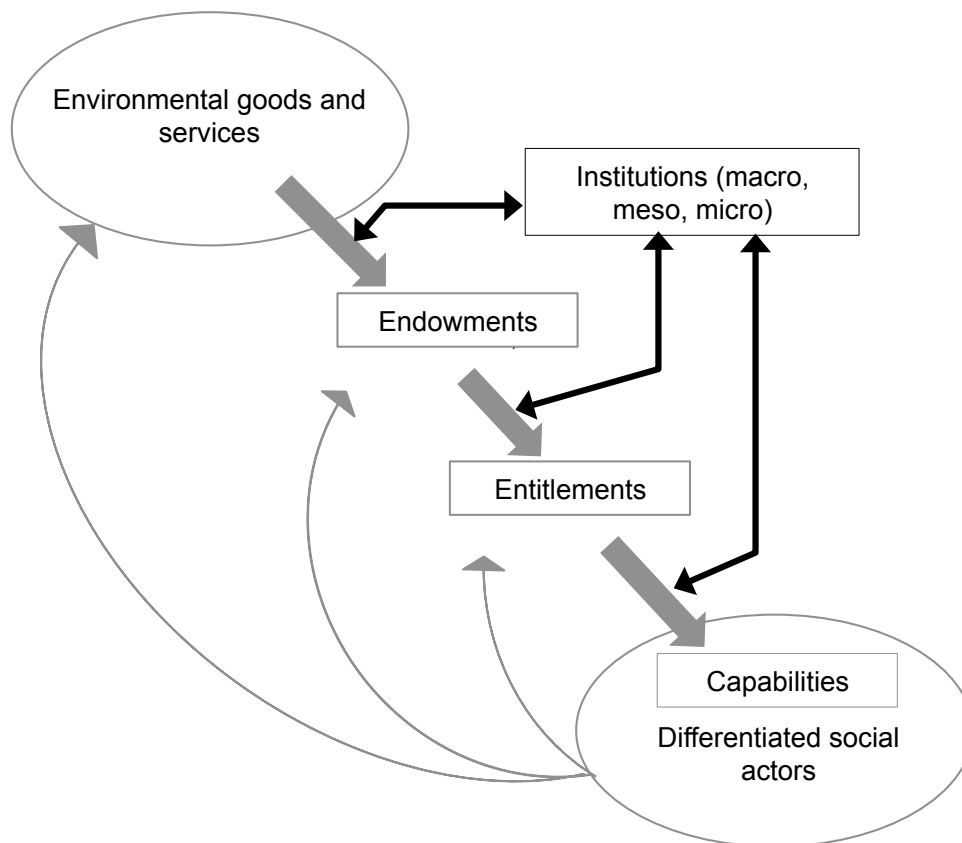
Peoples' assets are not merely *means* through which they make a living: they also give meaning to the person's world. ... [A]ssets - or what I call capitals in this framework - are not simply *resources* that people use in building livelihoods: they are assets that give them the *capability* to be and to act [emphasis in the original].

Ribot (2014) differentiates the actor orientated approach integral within livelihoods research to the more natural science, risk-hazard models in the tracing of causality. Ribot describes the way in which entitlement approaches tend to characterise the multiple (social) causes that result in vulnerability to a hazard event whilst impact analysis tends to focus on the multiple outcomes of a single hazard event. In the actor-orientated approaches, the causes of vulnerability are traced back to society rather than the hazard itself, which is seen as playing a role but not causing the damage or loss of livelihood for example.

Scoones (2009) and De Haan (2012), in reviewing livelihood literature identify two persistent critiques of livelihood approaches that have resulted in its decreasing prominence since the heyday of the late 1990s and early 2000s. The first relates to a failure to address structural issues and macro changes over the longer-term. For example, Scoones argues that livelihood approaches have not been good at addressing issues of globalisation (the bigger shifts in world markets and modes of production), longer-term transitions in rural economies and agrarian livelihoods, and alterations in environmental conditions as a result of drivers such as climate change. Secondly, livelihood approaches have been critiqued for failing to adequately address issues of power and politics. De Haan argues that, although structures, mediating processes and institutions appear in livelihood analysis the focus remains on capitals and assets (De Haan and Zoomers, 2005; and see also Ribot, 2014). Underpinning these two critiques is the divide between local level analysis focused on actors and the more macro analysis focused on structures.

The Environmental Entitlements approach developed by Leach *et al.* (1999) goes some way to addressing the critiques outlined above (certainly in social differentiation and partly in relation to power) and provides one of two theoretical touchstones for this research. The framework enables an exploration of how actors access, use and benefit from different components of the environment highlighting the central issue of social difference (see Figure 2-2).

Figure 2-2: Environmental Entitlements framework (from Leach *et al.*, 1999: 234).



The framework focuses on the processes by which environmental goods and services are mapped on to endowments (the rights and resources that people have) and thence to entitlements (utility derived from a combination of environmental goods and services and endowments) and capabilities (what people can be, their wellbeing). In so doing, the focus is shifted from a particular set of resources or assets to the dynamic processes that underpin an individual's or social actor's capabilities and wellbeing. This, it is argued

links both macro and the micro levels of concern. It situates [quoting Jenkins 1997: 2] "a disaggregated (or 'micro') analysis of the distinctive positions and vulnerabilities of particular [social actors] in relation to the 'macro' structural conditions of the prevalent political economy" (Leach *et al.*, 1999: 234).

Specifically, the following definitions are used. Endowments are defined as 'the rights and resources that social actors have' (*ibid*: 233). Environmental entitlements are 'alternative sets of utilities derived from environmental goods and services over which social actors have legitimate effective command and which are instrumental in achieving wellbeing' (*ibid*: 233). Capabilities are 'what people can do or be with their entitlements' (*ibid*: 233). Entitlements, more generally, are considered the 'outcome of

negotiations among social actors, involving power relationships and debates over meaning' (*ibid*: 235). Institutions are considered to be 'regularised patterns of behaviour between individuals and groups in society' (Mearns, 1995: 103). The mapping process is vital within the framework providing a dynamic element and critically interrogating how access to resources is gained (and lost) and utilised.

In describing the framework, Leach *et al.* (1999: 235) give the example of the collection of *Marantaceae* leaves in Ghana. In the example, the leaves are the environmental goods and services and found in forests and forest-savannah. If the sites that the leaves are found in are located outside of government-reserved forest and not on farmland, the leaves are the common property of the village. The endowment mapping is derived from membership of the village. The set of entitlements derived from the leaves can include their direct use or income from the sale of the leaves. An example of entitlement mapping is the negotiation between women and their husbands for labour time to collect the leaves. The utilities derived from the use of the leaves (cash income) contributes to the capabilities of the women to care for themselves and their family.

The framework builds on the work of Sen (1981; 1984) in a number of ways. First, Sen's notion of entitlements is developed through the conceptualisation of the dynamic process through which actors exert a legitimate effective command over resources to realise capabilities. Conceiving of the process beyond simple legal or market claims by highlighting the effectiveness through which actors are able to make claims brings in a wider array of means through which access to resources is secured (through kin networks, extended families, or social conventions and norms for example) (Devereux, 2001; Gray and Moseley, 2005; Sikor and Nguyen, 2007). Furthermore, this approach focuses on the dynamic interplay within communities through which access to resources is constantly renegotiated. This process helps to reveal the underlying power structures that are at play and emphasises the differentiated nature of social actors.

Second, Leach *et al* focus less on specific endowments and entitlements and more on the process through which assets are mapped from one to the other resulting in capability. The focus on the mapping highlights the dynamic nature of relationships, processes of change and on the importance of institutions. Leach *et al* expand their argument to include all formal and informal institutional structures operating at micro, meso and macro levels permitting a focus on power relations and the dynamic interplay between agency and structure. This approach means that claims can be framed on 'multiple, potentially conflicting, social and political-economic relations of access' (Ribot, 2014: 683)

In summary, the framework's conceptualisation of resource access and use (through mapping) and the focus on institutions are key attributes. Communities are viewed as dynamic and differentiated with conflicting values and claims. Institutions set the rules of the game and mediate the claims that people are able to make. Furthermore, social actors are able to shape the institutions, drawing out aspects of the recursive relationship between structure and agency. Despite the more explicit focus on institutions and differentiated actors, both De Haan and Zoomers (2005) and Scoones (2009) argue that power and politics remains an issue that could be further developed within livelihood approaches especially when addressing more historical structural issues. Additionally, Fraser (2003) notes that the Environmental Entitlements approach conceives of the environment as static and unchanging thus ignoring the inherent variability and propensity to change.

In responding to the critiques summarised above a number of academics have sought to integrate or posited that entitlement approaches can usefully be synthesized with other theoretical approaches. Ribot (2014: 679) states,

[V]ulnerability analysis, which has interrogated and theorized micro-macro relations of differentiation and access to resources and power, can inform adaptation and resilience studies to steer their analyses toward generative structures, preventing them from remaining internally oriented, proximate, ahistorical or atheoretical. Tracing out the chains that cause and disable capacity is then one productive entry point into a fuller analysis of vulnerability – and a necessary foundation for any adaptation or resilience program.

Similarly, Fraser (2003: 6-7) argues, '[b]y combining a socially driven framework such as that of entitlements with panarchy¹⁰, a tool of landscape ecology, we obtain new ways of exploring both the social and environmental characteristics of vulnerability'. Clearly, the potential for combining the more actor-orientated approaches of entitlements or vulnerability research with the more systems-orientated focus of resilience offers scope for increased explanatory power and insight (although it is not without its challenges). In the next section I describe the conceptual framework and set out how I bring together the two theoretical approaches.

¹⁰ Panarchy describes a nested set of adaptive cycles with multiple connections that operate at discrete ranges of scales and is a key concept within resilience theorising (Holling *et al.*, 2002).

2.4 Conceptual framing using resilience, entitlements and mobility

2.4.1 Resilience

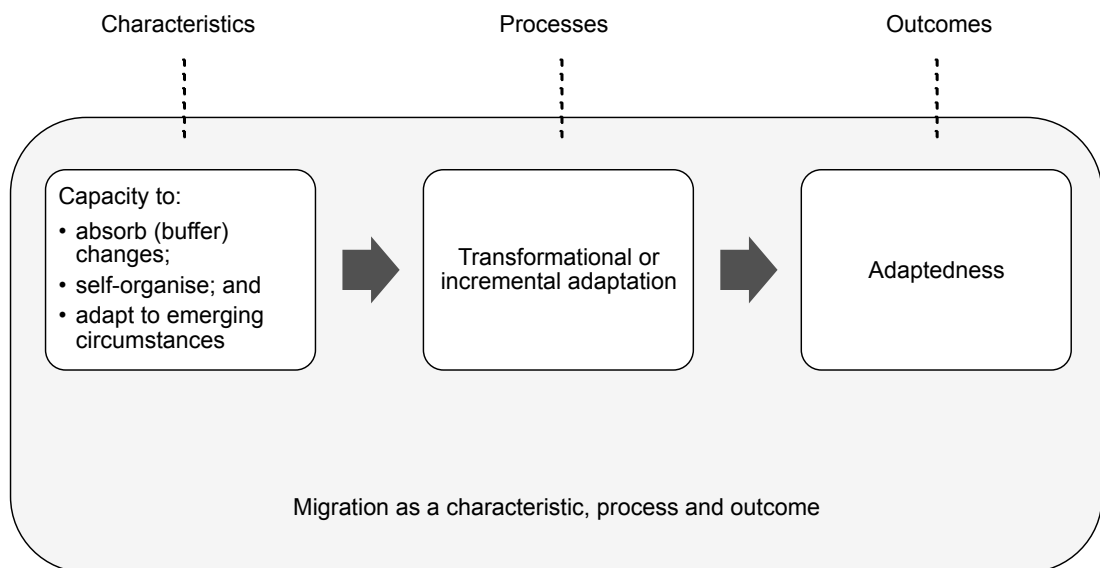
The utility of the resilience theory in relation to migration is evident in the number and variety of studies that have employed it to examine the issue of migration (see for example Adger *et al.*, 2002; Black *et al.*, 2011b; Collinson, 2011; Curran *et al.*, 2007; McLeman, 2010; McLeman and Hunter, 2010; McLeman and Smit, 2006). Advantages of approaching the migration environmental change nexus in this way include a focus that is inherently interdisciplinary, placing equal weight on societal and ecological processes. This means that it is particularly suited for resource-dependant communities faced with perturbations (such as environmental change or societal upheaval) (Adger, 2000; Warner, 2011). The theory permits an understanding of society environment interactions as complex (such as feedbacks, multiple stable states, permanence of change) with temporal and spatial elements, clearly key to an issue such as migration (Adger, 2000). Finally, it is concerned with characteristics, processes and outcomes (Nelson *et al.*, 2007) – again critical in a study on migration which is often described as a process with outcomes on both the origin and destination areas.

Despite its utility, systems thinking and a conceptualisation of the environment society relationship in socio-ecological terms is not without its criticisms, both theoretical and methodological. A key critique relates to the systems focus (discussed above). Allied to this is a research approach that tends to favour extensive methods and is predominantly quantitative in focus (Birkenholtz, 2011). Additionally at an investigative and explanatory level there are problems in identifying the most appropriate middle ground between complexity and simplicity (Fraser *et al.*, 2003). Lastly, conceptualising and operationalizing the key tenets of theory is problematic and there are substantial issues in measuring resilience and associated concepts such as adaptive capacity and adaptation as Adger (2006) acknowledges.

A key issue underpinning these criticisms is the lack of clarity surrounding the use of the term as it has expanded from its ecological origins (Brand and Jax, 2007). Resilience can be a theory, a concept within a broader visualisation of human-environment interactions (socio-ecological systems), a normative metaphor and its meaning can change depending on the particular strand of academic thinking that is using the term (Carpenter *et al.*, 2001: 765). For my purposes, I borrow from Nelson *et al.* (2007) and understand resilience as a set of characteristics that incorporates a buffer capacity in addition to the capacity to self-organise and adapt to emerging circumstances. This system is subject to perturbations (biophysical or social) that form one part of a reflexive relationship with transformational or incremental adaptive

processes that result in an adapted outcome (see Figure 2-3). Migration is included as a characteristic, process and outcome; this acknowledges its presence as an existing feature in China and the important role it potentially plays in mediating resilience (Black *et al.*, 2011b; Deshingkar, 2012; Morrissey, 2009).

Figure 2-3: Diagram to show my understanding of the concept of resilience (adapted from Adger, 2000; Berkes *et al.*, 2003; Gunderson and Holling, 2002; Nelson *et al.*, 2007).



2.4.2 Resilience and entitlements

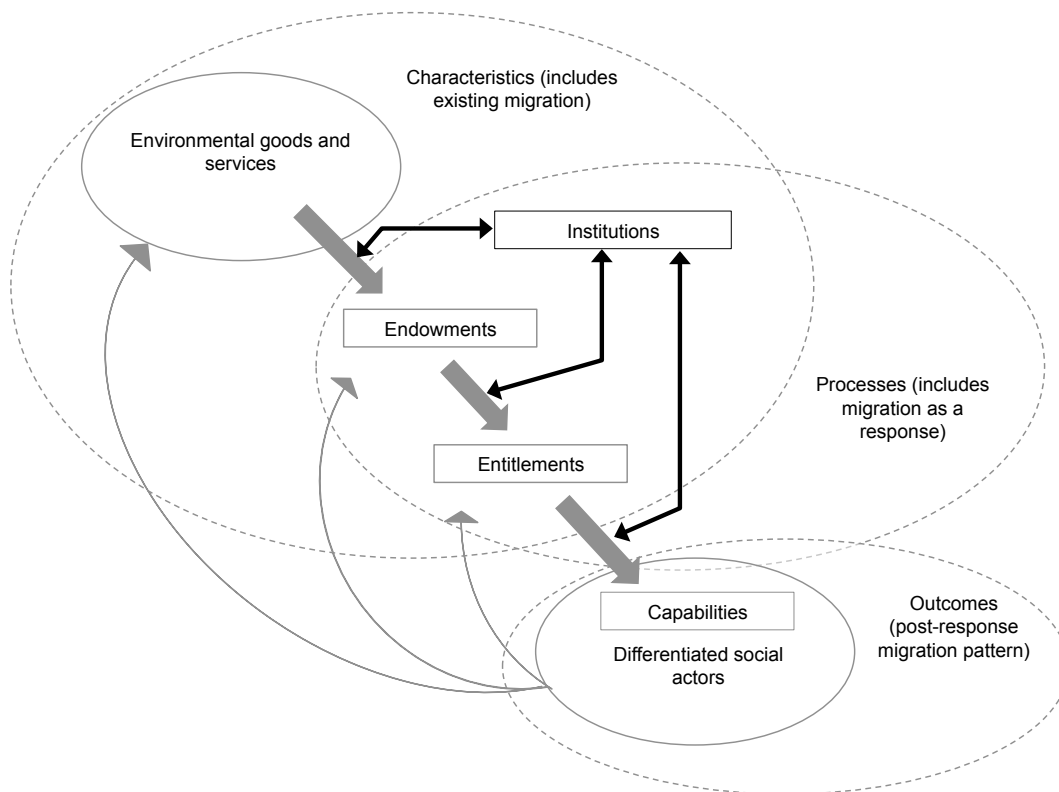
A central feature of systems thinking is the focus on the system as the unit of analysis; this tends to result in the exclusion of more *local explanations* centred upon individual actors, agency, social differentiation and power. An entitlements approach offers an interesting counterpoint to resilience with a tendency to apply it to smaller units of analysis and a greater focus on issues associated with social differentiation and, by implication, power through the examination of endowments, entitlements and capabilities. Indeed the traditions of political and cultural ecology are influential in the field of vulnerability, resiliency, and adaptability research as Robbins (2004) highlights and offer a natural synergy with socio-ecological approaches¹¹ (Bailey, 2011). Both approaches are rooted in ecology and understanding the reflexive relationship with society; there is an appreciation that the world is complex with non-linear relationships and surprises and an acknowledgement that multiple stable states exist. However, despite the shared heritage and similarities, there are tensions in combing actor- and system-orientated approaches (see, for example, Adger, 2006; Fraser, 2003; Nelson *et al.*, 2007; Ribot, 2014). Yet even with these concerns, a theoretical framework that

¹¹ See, for example, work by Blaikie on natural hazards (1994), Blaikie and Brookfield (1987) on land degradation and Bohle (1994) on vulnerability and food security.

combines the theory of resilience with an entitlements approach offers an interesting avenue to explore the migration environmental change nexus.

Figure 2-4 shows how I envisage the concepts associated with resilience (discussed earlier) as it relates to the Environmental Entitlements framework in situations of environmental change. The characteristics of a system and / or unit of exposure include a buffer capacity in addition to the capacity to self-organise and adapt to emerging circumstances and can be measured through metrics that examine environmental goods and services and endowments. The processes of adaptation (either transformational or incremental) are constrained by the characteristics of the system and / or unit of exposure and determined by the dynamic mapping of environmental goods and services on to endowments and subsequently to entitlements. This results in the outcome (adaptedness) and a system's and / or unit of exposure's capability. The impact of environmental change (in this case climatic variability) impacts on every single aspect of this process from the characteristics of the system through to the processes of adaptation and the outcome in terms of capability and wellbeing (see Black *et al.*, 2011a).

Figure 2-4: Concept of resilience mapped on to the Environmental Entitlements framework (adapted from Adger, 2000; Berkes *et al.*, 2003; Black *et al.*, 2011a; Gunderson and Holling, 2002; Leach *et al.*, 1999; Nelson *et al.*, 2007).



Synergy between resilience and entitlements

Environmental events and change (driven by climatic variability) are transformed into differentiated outcomes via social structures; the same event can have multiple outcomes depending on the resilience of a system or unit of exposure. The ability to manage stresses is not given; it is produced by unequal access to resources, poverty and lack of representation for example (Ribot 2010). Developing this thread, Langrigde *et al* (2006: 3) argue,

[T]he ability to gain, control, and maintain access to a critical resource amplifies a community's entitlements, creates a buffer during times of scarcity, and increases a community's ability to manage stress. It follows that understanding how resilience is generated requires research into who achieves access, why, and with what impacts.

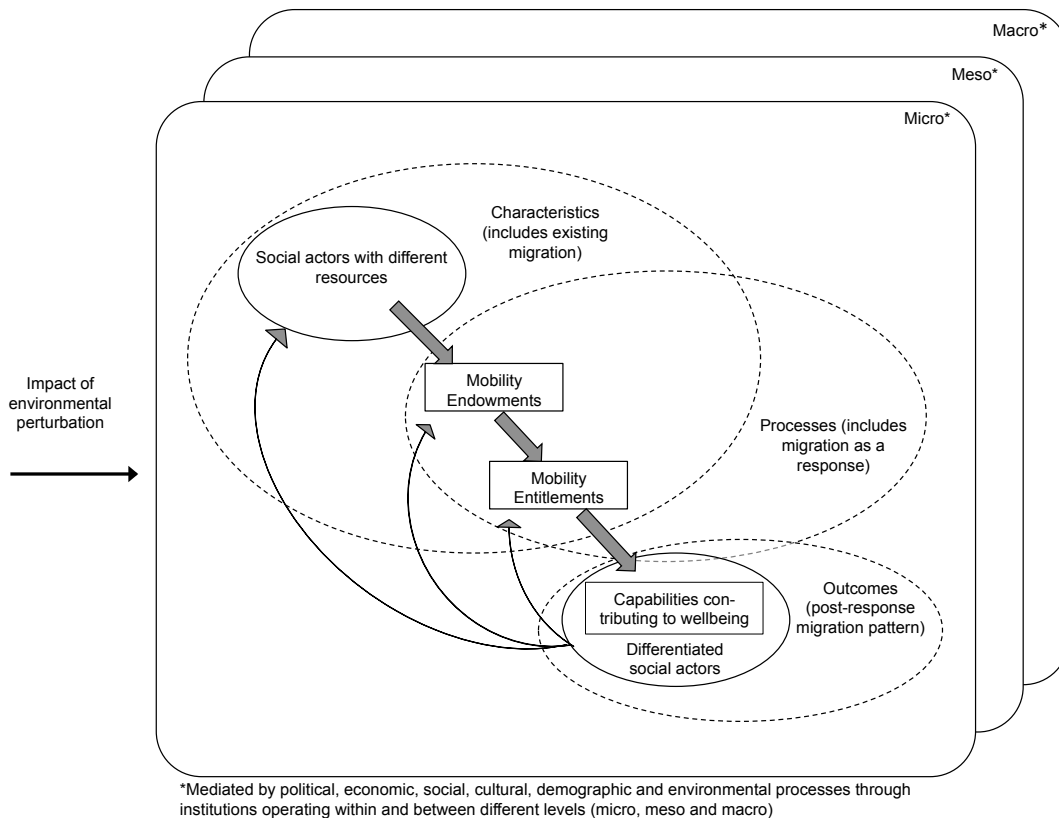
This quote highlights the importance of access in mediating resilience and is echoed by Leach *et al* (1999) in emphasizing the importance of an *effective command* over entitlements for differentiated social actors. Similarly Carr (2005), in his study on migration in Ghana, highlights the importance of power and social differentiation in mediating control and access to resources. This line of reasoning is supported by other academics that argue strongly that there are clear links between resilience, endowments and entitlements (see, for example, Collinson, 2011; Eakin and Wehbe, 2009; Fraser, 2003; Morse *et al.*, 2013; Scoones, 2009; Thulstrup, 2014).

Building on this discussion the conceptual framework is presented in Figure 2-5 and incorporates a version of the Environmental Entitlements framework that has been modified in four important ways¹². Firstly, actors are placed at the centre of the framework by highlighting how social differences and power imbalances impact on the endowments and entitlements. Secondly, mobility endowments and mobility entitlements are foregrounded to allow specific investigation of the dynamic processes that enable social actors to have mobility rights and the ability to convert these rights into physical mobility. Thirdly, the framework broadens the definition of environmental goods and services to resources in general to acknowledge the importance that off farm activities play in rural livelihoods (Ellis, 2000). Fourthly, the focus on capacities is extended to specifically include the concept of wellbeing, acknowledging the contribution of Bebbington (1999) and increasing interest in policy and academic circles of late. Within this framework, the issue of power is not addressed directly but

¹² See Sikor and Nguyen (2007) for a version of the Environmental Entitlements Framework adapted for other uses (in this case forest resources).

understood implicitly through the exploration of the differentiated experiences of stakeholders.

Figure 2-5: Concept of resilience mapped on to the mobility entitlements framework (an adapted version of the Environmental entitlements framework) (from Adger, 2000; Berkes et al., 2003; Black et al., 2011a; Gunderson and Holling, 2002; Leach et al., 1999; Nelson et al., 2007).



In approaching the migration environmental change nexus in this way the focus is shifted towards the scalar structures that either impede or facilitate movement and the situations in which individuals and households employ mobility. Institutions are considered to be ‘the rules of the game or regularized patterns of behavior between individuals and groups’ drawing on definitions of Mearns (1995) and North (1990). As such, institutions mediate interactions between people and the environment. The focus on institutions and capabilities permits the exploration, to some extent, of the recursive relationship between agency and structure. Agency is understood as the process by which actors are able to act independently and not in a way determined by social structures. Furthermore, actors have the ability to influence and challenge (or not) the social structures given form through institutions (Jackson, 1998; Jackson, 1999).

This approach, couched in terms of mobility, takes inspiration from the mobilities paradigm and the work of Urry (2000; 2007) amongst others. The mobilities paradigm

sees human mobility as one of five types of movement. The other movement types are the physical movement of objects, imaginative travel (through television programmes for example), virtual travel (such as Google Earth or through GIS programmes) and communicative travel (messages and texts for example) (Urry, 2007: 47). The broader conceptualisation of mobility is more inclusive of some of the consequences of corporeal movements, such as remittances. Furthermore, the idea of imaginative and communicative travel enables greater exploration of other aspects of peoples' lives and spatial domains beyond physical movement (or non-movement) and presence (or absence). The work draws on the ideas of complex adaptive systems and seeks to capture dynamic processes rejecting the more sedentarist theories and snapshot approaches present in much social science (Adey, 2010; Cresswell, 2006) and critiqued by migration scholars (see section 2.1.2). The use of mobilities as a concept logically follows from the focus on endowments and entitlements in that it seeks to capture processes that act to 'enhance the mobilities of some while reinforcing the immobility of others' (Sheller and Urry, 2006: 213, see also McLeman and Hunter, 2010).

The framework provides an appropriate space for the investigation of the processes by which the environment manifests itself in migration and impacts on mobility. Furthermore, by incorporating the environment as a baseline characteristic (within the resources of socially differentiated actors) and conceptualizing a number of factors as exogenous (political, economic, social, environmental and demographic), the framework is sufficiently complex to enable the characterisation of a migration decision and can work at different levels of analysis permitting the examination of cross-scale interactions. Allied to this, is the power to understand and explain the relative importance of proximate and driving forces through which individual or family decisions to migrate (or not) can be investigated.

The framework is also particularly apposite for studying migration in China as it permits a focus on the institutional structures that are so important in (dis)enabling migration (such as *Hukou*). Furthermore, the combination of a resilience approach with entitlements (that is rooted in more Marxist schools of thought) offers a pleasing synergy with the mix of socialism and capitalism that coexist in China today and could be seen as answering calls for 'country specific' theorising in China (Zhang, 2008). In short, the analytical framework not only offers considerable explanatory power but also provides a suitable canvas on which interesting and novel research questions can be posed.

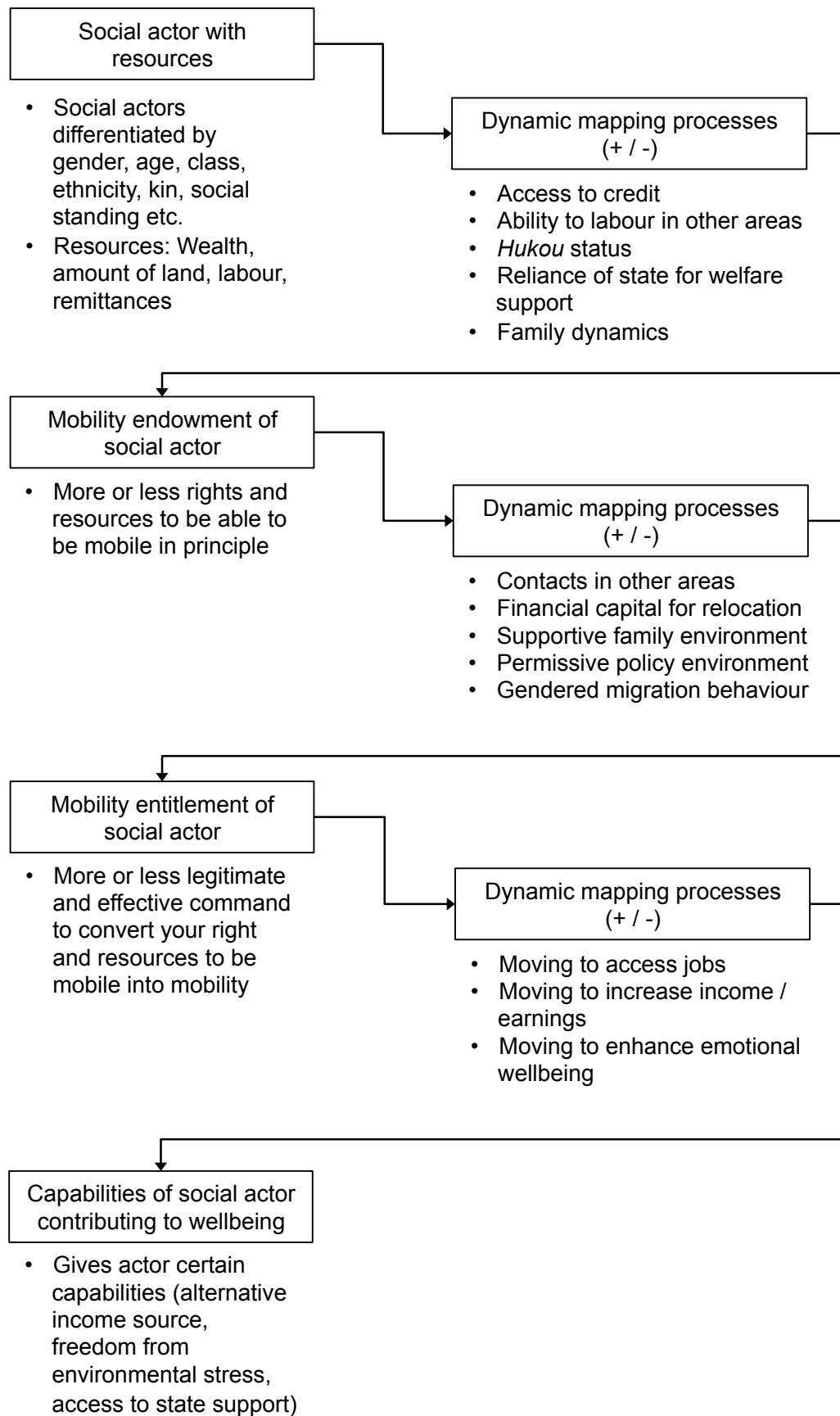
I address the following question and sub-questions in this research:

Does (im)mobility influence the resilience of individuals, households and communities under conditions of climatically driven environmental change and, if so, how?

- a) What are the major determinants that affect mobility endowments and mobility entitlements in the case study sites?
- b) What are the processes by which drought and flood affect the endowment and entitlement to mobility at an individual, household and community level and how do these fit within broader adaptation strategies?
- c) Are those with greater endowment and entitlement to mobility more resilient to environmental shocks?

A key attribute of the framework is the ability to probe the role of institutions as mediating the processes through which resources are mapped on to endowments and entitlements (see Figure 2-6 for examples of possible mapping processes) and the relationship of these processes with resilience. In so doing, the framework also provides a means to operationalise resilience through an understanding of endowments and entitlements thus representing an attempt to bridge the divide between actor- and system-orientated approaches. Finally, the focus on mobility endowments and mobility entitlements specifically provides a means to assess the role of (im)mobility and its relationship with resilience to environmental change specifically and resilience more generally.

Figure 2-6: Hypothetical example showing possible mapping of the resources of an actor through their mobility endowments and mobility entitlements to their capabilities and wellbeing.



2.5 Summary

In this chapter I have traced the role of the environment within theories of migration arguing that much of the debate can be boiled down to the tension between explanations that focus on the individual and those that highlight structural drivers. More recently, theorising has become more complex as academics have sought to explain the heterogeneity around them and better represent the recursive relationship between agency and structure. Evidence on the role of the environment within migration research is contradictory and with multiple drivers working at different scales.

To explore the migration environmental change nexus I have drawn upon two literatures: resilience and livelihoods. I argue that a key attribute of resilience thinking is the holistic approach and the ability to explore the relationships between different system components. However, resilience thinking has been critiqued for not addressing the fundamental issues of power and social difference. In response, a number of scholars have proposed to integrate resilience with other approaches. Within the literature, adaptation and adaptive capacity provide an appropriate means to combine resilience with other, more actor-orientated, approaches. Livelihood approaches, specifically the Environmental Entitlements framework provide a useful counterpoint to resilience frameworks, privileging the actor over the system and exploring the causes and mediating processes that result in vulnerability.

The analytical framework presented in the previous section combines the Environmental Entitlements approach with a resilience framing. The approach provides a canvass to explore the role of mobility within a rural setting and to explore the relationship between mobility and resilience. At a more abstract level the framework represents an attempt to bridge the divide between actor- and system-orientated approaches utilising adaptation and adaptive capacity as bridging concepts. Additionally, the framework also represents an attempt to locate socially differentiated actors more centrally within a resilience framing responding to recent critiques.

In the next chapter I set out my methodological approach before presenting the main empirical findings in the subsequent three chapters.

3 Methodology

Chapter 2 reviewed migration theories and the key theoretical concepts that underpin this research as well as identified some key gaps in existing knowledge. This chapter describes the research approach I adopt to explore climatically driven environmental change with specific reference to mobility. The chapter begins by summarising the interdisciplinary research design before describing the research methods and techniques employed in the field in addition to the analytical strategies used. Section three describes the research sites in more detail (in relation to their social, demographic, economic and environmental characteristics) including some simple summary statistics of the populations and settlements that were sampled. The chapter concludes with reflections on some of the limitations of the research and key ethical issues experienced through the research process.

3.1 Research design

Approaches to assessing the impact of the environment on migration can be divided into two broad groups within the literature: first, an identification of environmental hotspots and some form of integrated assessment to establish those at risk, of which all or a proportion will be expected to migrate. The second, more analytical approach, attempts to discern the environmental signal from other drivers of migration through a variety of methods including ecological interference, individual analysis, time series analysis, multi-level analysis, agent-based modelling and ethnographies (Findlay, 2011; Kniveton *et al.*, 2008; Pigué *et al.*, 2011). For the purposes of this research, I will undertake a fine-grained, multi-level analysis of migration under conditions of environmental change that draws on a number of the analytical methods outlined above.

I use an analogue comparative case study approach (Morrissey, 2009; Yin, 2011). Adger *et al* (2003) differentiate analogues by space and time. Temporal analogues involve taking information from past or present responses to climate change and making inferences about a current or future point in time. Spatial analogues examine present day behaviour and apply the learning to other locations. The use of analogues is widespread in research on climate change adaptation providing insight into real-life events and responses. However, analogues are not without their drawbacks: chief among these is their inability to provide information on changes beyond present day norms¹³ and the unpredictability of future human behaviours and responses to stimuli.

¹³ This encapsulates the issue of stationarity whereby it is assumed the natural systems fluctuate within certain limits. Climate change and other drivers (such as deforestation or population growth and

This is particularly relevant in relation to climate change where no past analogues will exist for certain events (Kniveton *et al.*, 2009; Patt *et al.*, 2005; Williams and Jackson, 2007). Although imperfect, analogues remain one of the only ways to generate empirical insights into human behaviour under conditions of climatic variability that are likely to mirror to some extent future conditions and thus remain a valid research approach. Accordingly, this research uses a temporal analogue to understand the response of human systems to current climatic perturbations such as droughts and floods in order to make inferences about what might happen in the future (Ford *et al.*, 2010; Glantz, 1990; Glantz, 1991; Glantz, 1996; Goulden, 2006).

When designing the research I was aware of the trade-offs between detail and extent. Migration research tends to fracture along lines of scale. On the one hand extensive approaches focus on regional surveys to identify risk and hence vulnerability (Gemenne, 2011; Piguet, 2010) and on the other intensive case studies are employed to focus on a set of individuals, households or communities with the intention of establishing how they are responding to a change in circumstances (be it political, social, environmental). For this research, I adopted an intensive approach for a number of reasons.

First, fine-scaled analysis is more appropriate to understand the impact of shorter episodic events. Whereas working at a coarser resolution can reduce the sensitivity of an investigation to such an extent that the impact of finer grained variations are not captured or well represented (Poston and Zhang, 2008; Slingo *et al.*, 2005). Second, extensive analysis limits the extent to which one can ask why, dealing as it does in aggregated units (Ford *et al.*, 2010). I was more interested in understanding the impacts of climatic variability on individuals, households and communities and how they responded to such events. Third, the issue of data access and reliability was a significant cause for concern (Simelton, 2011: 37-38; Zhang, 2008; Zhang, 2011). Therefore, I determined that a research approach that generated the majority of the data (with its limitations known to me) was a more reliable and robust approach¹⁴.

As discussed earlier (see section 2.1.2), Sayre (2005) (amongst others) highlights the importance of links between levels arguing that this necessitates cross-scale and interdisciplinary research. The approach I adopted for this research (an intensive, comparative case study) enables me to investigate, to some extent, at certain levels, the links referred to by Sayre (*ibid*). Specifically, I explore the tensions and synergies

associated impacts) acts to change these limits rendering the issue of stationarity null and void (Milly *et al.*, 2008).

¹⁴ Additionally, accessing datasets by non-nationals in China is notoriously difficult especially when formal permission is required (something over which I could exert little influence).

between the individual, the household and the village and use methods (specifically the questionnaire survey, semi-structured interviews and RRA activities) that generate a degree of time-varying data; thus responding to the call for cross-scale and nested research that are often at the core of explanations for people environment interactions (Adger *et al.*, 2009a; Birkenholtz, 2011; Mauro, 2009). Links with larger scales were taken into account during the research but were not explicitly addressed. For example, the conceptual framework was designed with the specific Chinese institutional context in mind, some of the research instruments captured influences of larger scales and the analysis drew on issues and processes that were occurring at a regional or national level.

The mixed methods approach I employed has been utilised in recent research (specifically the EACH-FOR and Rainfalls projects) on the migration-climate change nexus (Piguet, 2010; Warner, 2011; Warner *et al.*, 2012; Warner *et al.*, 2009) and interdisciplinary research more generally (Nuijten, 2011). One of the key strengths of this sort of approach is the different perspectives and layers of understanding that are generated through the data collection and analysis. The multiple methods (such as biophysical climate data, surveying, rural appraisal activities, and interviews) used, enabled me to gain a broad understanding of the ways in which individuals, households, and communities responded to floods and droughts and role of mobility within this response. A further important benefit of the multi-method approach is the enhanced level of analytical rigour engendered by working iteratively across the different data. In sum, the methodology permitted me to interrogate the 'how' and 'why' – a crucial strength of case study research (Yin, 2011).

3.2 Research methods

3.2.1 Overview of research methods

The data generation and analysis was guided by my choice of theoretical framework (see section 2.4). From the concepts and research gaps I developed a set of research questions that, cumulatively, informed my choice of research instruments. The research was primarily deductive although space was provided for more inductive elements mainly through the semi-structured interviews with migrants in Shanghai and households in the rural case study sites. This research approach was used to explore the impact of environmental change driven by climatic variability in two villages in rural Anhui. Additional research with migrants originating (predominantly) from the two villages was undertaken in Shanghai. The study aims to contribute situated empirical and analytical knowledge about the interplay of mobility with resilience under conditions of climatically driven environmental change. Table 3-1 shows the research

questions, data needs and methods. The questions were not fixed and changed slightly during the research process as I enhanced my knowledge and understanding of the local context from which the empirical data are drawn.

Table 3-1: Research questions, methods, and data needs and / or potential lines of enquiry.

Research question	Sub-questions	Method	Level ^a	Further information / lines of enquiry
A.) What are the major determinants that affect mobility endowments and mobility entitlements in the case study sites?	A1.) Which people, households or socially differentiated groups have a greater endowment to mobility and why?	Census map with information on migrants	C(L)	What characterises those with greater mobility endowments (different types of assets, networks, historical mobility and personal characteristics)? Which households or groups have the ability to migrate? Why? What are the main resources / livelihood strategies that socially differentiated groups have and how does this map on to mobility? What are the social, demographic, cultural, historical, economic, political characteristics of the more mobile groups? Under what conditions do individuals / households migrate? What role do institutions play in the right to relocate? Does this differ between rural case study locations?
		Community resource mapping with transect walk	C	
		Wealth ranking exercise	G(L)	
		Discussion on positive and negative impacts of env. change	G	
		Discussion on causes and effects of migration	G	
		Questionnaire survey	H(L)	
	A2.) Which people, households or socially differentiated groups have a greater entitlement to mobility and why?	Key informant semi-structured interviews	I(H)	Who migrated, why and under what conditions? What are the social, demographic, cultural, historical, economic, political characteristics of the households who have employed migration? How do the characteristics of migrant households differ to non-migrant households? Was mobility employed during or after environmental shock? What is the influence of the state and other institutions in relocation decision? What reasons do urban migrants give for migrating? What reasons do urban migrants give for the immobility / mobility of certain households in their home village? Compare findings from A1 and A2 to explore similarities and differences between individuals, households and socially differentiated groups
		Census map with information on migrants	C(L)	
		Wealth ranking exercise	G(L)	
		Discussion on causes and effects of migration	G	
		Seasonal calendar exercise	G	
		Historical calendar exercise	G	
A3.) Are those with an endowment to mobility the same as those with an entitlement to mobility?	Questionnaire survey	H(L)		
	Key informant semi-structured interviews	I(H)		
	Analysis		N/A	

Table 3-1 (cont.): Research questions, methods, and data needs and / or potential lines of enquiry.

Research question	Sub-questions	Method	Level ^a	Further information / lines of enquiry	
B.) What are the processes by which drought and flood affect the endowment and entitlement to mobility at an individual, household, and community level and how do these fit within broader adaptation strategies	B1.) What are the key pathways through which the impacts of drought / flood manifests itself on rural lives?	Discussion of the causes and effects of migration	G	How does drought / flood impact on rural livelihoods? How has the drought / flood affected farm and off-farm related activities? (How) Is environmental perceived in relation to the weather What are the perceived and psychological affects of the drought / flood at individual, household and community levels? How has the drought / flood affected migration? Consider changes in: a.) existing migration patterns (temporal and spatial); b.) remittances; and c.) type of migration (risk spreading, adaptation, coping etc) Are their positive impacts of the drought / flood (state aid, support, improved infrastructure)?	
		Discussion on positive and negative impacts of env. change	G		
	B2.) How do individuals, households and communities cope and adapt to drought or flood	Questionnaire survey	H(I)		
		Key informant semi-structured interviews	I(H)		
	B3.) Do the pathways of environmental change impact on the determinants of mobility endowments and mobility entitlements?	Analysis	Discussion on positive and negative impacts of env. change	G	How do affected individuals, households and groups cope in aftermath? What were the main coping and adaptation behaviours adopted and by whom? Were there any longer-term measures implemented to reduce risk and exposure
			Seasonal calendar exercise	G	How were personal networks utilised and what role did remittances play
			Historical calendar exercise	G	How important were formal and informal institutions
			Questionnaire survey	H(I)	Was mobility used in any way, if so how?
			Key informant semi-structured interviews	I(H)	Were perceived changes in environment a factor in migration decisions
				N/A	Synthesise findings of B1 and B2 to generate understanding regarding impact of environmental change on livelihoods and the use of mobility as a coping or adaptive response

Table 3-1 (cont.): Research questions, methods, and data needs and / or potential lines of enquiry.

Research question	Sub-questions	Method	Level ^a	Further information / lines of enquiry
C.) Are those with greater entitlement and mobility more resilient to environmental shocks?	C1.) What is the contribution of mobility to individual level resilience?	Key informant semi-structured interviews	I(H)	What were the coping and adaptation strategies adopted? How has mobility affected livelihoods? What has been the impact of mobility on other household members? What new risks and exposures have been engendered through use of mobility, what risks and exposures have been attenuated? What does a lack of mobility mean for resilience? Focus on migrants in Shanghai and households in case study sites
		Questionnaire survey	H(I)	
		Census map with information on migrants	C(I)	
	C2.) What is the contribution of mobility to household level resilience?	Wealth ranking exercise	G(I)	Which households are more resilient?
		Key informant semi-structured interviews	I(H)	How do measures of resilience map on to the use of mobility (mobility endowments and mobility entitlements)?
		Questionnaire survey	H(I)	What were the coping and adaptation strategies adopted?
		Census map with information on migrants	C(I)	How has mobility affected livelihoods? What has been the impact of mobility on other households / the village as a whole?
	C3.) What is the contribution of mobility to community level resilience?	Wealth ranking exercise	G(I)	What benefits has mobility brought the village? What drawbacks has mobility resulted in at a village level? What is the trajectory of the village?
		Discussion on positive and negative impacts of env. change	G	
		Discussion on causes and effects of migration	G	
	C4.) What are the interactions between levels	Key informant semi-structured interviews	I(H)	Synthesis the findings of C1, C2 and C3 to identify positive and negative cross scale interactions (synergies and feedbacks) on resilience
		Analysis	N/A	

^a Refers to the level at which the research instrument was applied and the data that it generated. The letters in parenthesis indicate data collected at an additional level: C – Community; G – Focus group; H – Household; I – Individual; N/A – Not Applicable

3.2.2 Spatial and temporal research issues

Research timing

The research was split into three phases. During phase one (November 2012 to March 2013), I identified suitable rural locations for my field research through expert interviews and visits to potential sites. Once located, I undertook semi-structured interviews with village cadres to gain an insight into the presence and severity of environmental change and an overview of the socio-economic conditions. Once potential sites were identified and approval to carry out the research granted, I undertook a number of rural appraisal exercises. These appraisal exercises served three main purposes:

- to increase my understanding the context within which I was working
- to help build rapport between the community, myself and research team
- to provide confirmation that the sites were suitable for more in-depth research.

Additionally, during phase one, I also performed a number of informal semi-structured interviews to try out interview techniques and questions. The information from this phase was used to inform the subsequent research in phase two.

The focus of phase two (April 2013 to July 2013) was on the development and implementation of the questionnaire survey. Using insights generated from phase one, a questionnaire survey was developed and piloted before being implemented in the two case study sites. Through the rural appraisal activities and the questionnaire survey, contacts were made with household members who had migrated to work in Shanghai. Interviews were carried out with six migrants who originated from Anhui and had been working outside of the villages for between two and 20 years. The final phase of the research was undertaken in February 2014 and was timed to coincide with the Chinese New Year. After a period of analysis, emerging findings and novel lines of enquiry were pursued through a series of follow up interviews with households and returned migrants. Six interviews were undertaken in each case study site. In total, the data collection were spaced out over the course of a year and a half enabling me to see and experience some of the rhythms and cycles of village life (such as Chinese New Year and changes in the weather).

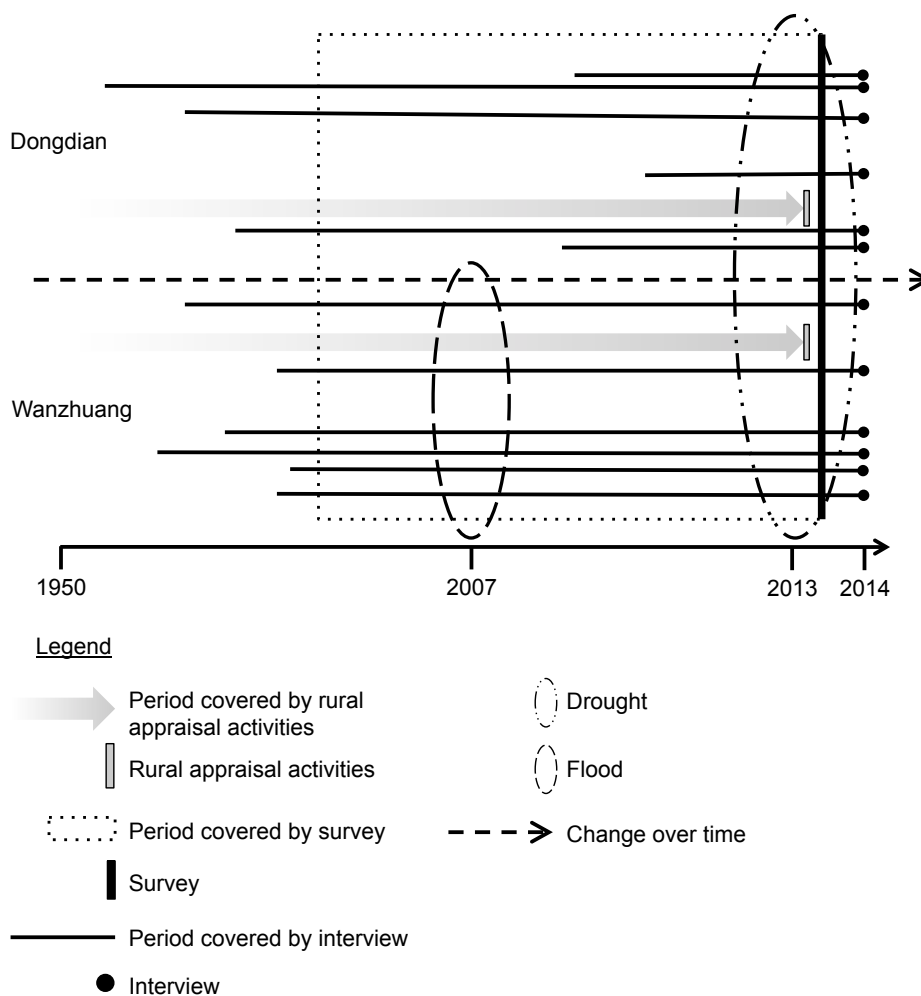
Dynamic change

Change is not isolated in space or time and a specific event will be the result of a combination of factors operating at different scales (Gunderson and Holling, 2002). Understanding the present requires an understanding of what preceded it and (to some

extent) an appreciation of what the future may hold (Allison, 1984). Change is a dynamic process and this needs to be represented in the research design (Kniveton *et al.*, 2008). Yet many approaches are unable to capture time varying variables as all the information is collected at the same time (in a questionnaire survey for example). Bryman (2008) asserts that this snapshot approach to data collection creates ambiguity in the direction of the causal influence, as there is no time ordering to the variables.

To obviate the issue of causality in sequencing, migration scholars often use longitudinal data (such as panel or cohort studies) to assess change over time; the advantage being that variables are time ordered so statements about causality are generally more robust (assuming *ceteris paribus*) as the researcher knows which of the variables occurred first (see, for example, Gray and Mueller, 2012). Longitudinal approaches are often reliant on large data sets, tend to be expensive and time-consuming to implement, and were not practicable for this research project. However, other options are available and the research employed three main techniques to generate time varying data. The first technique utilised rural appraisal exercises that were sensitive to dynamic processes (such as community-based trend analysis). The second technique generated time-sensitive data by utilising survey respondents' ability to recall past migration behaviour within the household. The third technique was embedded in the semi-structured interviews and derived time sensitive information through the recounting of specific periods of interviewees' lives (see Figure 3-1).

Figure 3-1: Schematic showing three main data collection techniques (excludes biophysical data) through which the dynamic changes are captured within case study sites in relation to the two climatically driven environmental perturbations under study*.



* Please note the schematic is a graphical representation of the methods and should not read as a scaled summary of the importance of specific methods or the x-axis.

Bounding the research and site selection

Conceptualising human environment relations in terms of a system places a great deal of emphasis on the boundaries of the system in question. In resilience research despite the theoretically equal focus on social and ecological properties most of the literature uses ecological characteristics to define the boundaries of the system under consideration (focusing on a river catchment or lake for example) (Ernstson *et al.*, 2010)¹⁵. The selection of a particular unit of analysis has the potential to significantly influence the research outcomes by determining the phenomenon under observation, how it is measured, perceived and understood and the conclusions that can be drawn (Polsky and Easterling III, 2001). Furthermore, even if the boundaries of a system were

¹⁵ This issue is further highlighted in the Resilience Alliance workbook for practitioners (Gunderson *et al.*, 2010) that almost invariably cites ecological rather than social examples.

self-evidently identifiable, then arbitrarily defining the unit of analysis would still be cause for significant concern (Sayre, 2005). Indeed most analyses that apply resilience theory tend to focus on the system rather than specific units of exposure (Eakin and Wehbe, 2009).

Clearly, the choice of scale, level, extent and resolution¹⁶ critically influence the patterns that are observable (Gibson *et al.*, 2000) both for the research and the participants. Such issues are concisely summarised by Leach *et al* (2003) who describe the process by which actors frame a system in a particular way depending on their choice of elements and subjective judgements. They define a system as consisting of, 'social, institutional, ecological and technological elements interacting in dynamic ways' (Leach *et al.*, 2010: 43) and argue that a system's structure and functions can be understood in different ways depending on the specific choice of elements (such as scale, boundaries, relationships and, outputs) and subjective judgements (perspectives, interests and values).

Exploring the role of mobility in contributing to resilience provides some interesting conceptual challenges regarding the system under study; for example identifying the boundaries of the system (Marshall and Marshall, 2007). I have focused the study administratively and utilised the boundaries of the (natural) village in determining its limits. These boundaries are necessarily fuzzy and porous, owing to the central role of mobility within the research. For example, some individuals within the case study sites opt to leave the village, in so doing one sub-system is exchanged for another in terms of locality, lifestyle and livelihood and a large proportion of contacts and networks. However, ties with the sending area / system remain although much weakened. Similarly, for those who remain in the village but opt to stretch their livelihoods to include other locations the conception of the village as a bounded object again proves unhelpful. In light of these two general cases, I have opted to use the space occupied by those individuals and households with the centre of gravity defined by the *de facto* place of residence as the system of interest.

Despite the issues highlighted above there are a number of advantages in using a clearly defined administrative boundary to identify the focal point of the study. Bilsborrow (2009: 118) defines migration as a process that involves a change of residence across an administrative boundary. Using the natural village as a boundary not only provided a means to limit the spatial extent of the study area but also a boundary to assist in defining what constitutes migration. In addition, the rural appraisal activities revealed that the residents identified with and felt a sense of belonging to the

¹⁶ For definitions of scale, level, extent and resolution see Gibson *et al* (2000: 219).

natural village. Lastly, there were also a number of institutions (for example production teams) and administrative functions that were directed towards this level of the administrative hierarchy. In sum, these more practical issues aligned with my desire to generate fine-grained data and analysis make the natural village the most appropriate means of bounding the research in origin areas despite the concerns outlined above.

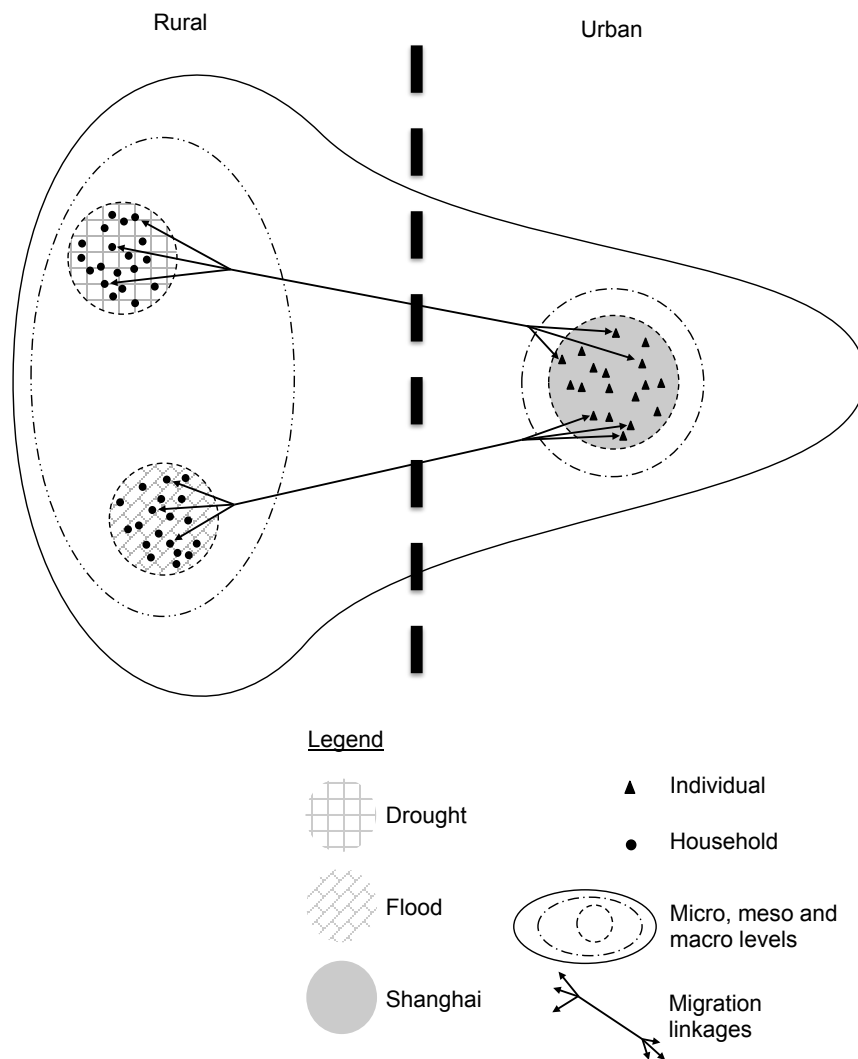
Furthermore, through the village level case study approach I am able to generate detailed, fine-grained information on the research topic concerning strategies and behaviours adopted by individuals and households in response to changing environmental conditions. As I show through my description of the case study sites (see section 3.3 below) the villages are not unique and represent what Bryman (2008: 70) describes as an 'exemplifying case'. An exemplifying case is representative of normal and everyday responses to environmental change. The villages were purposively selected based on their socio-economic characteristics (rural, agricultural, and poor) and the presence of recent climatically driven environmental change.

Two rural sites were selected to include an area that has experienced a flood and an area that has experienced a drought. Migration was an existing characteristic of both sites. The rural sites were identified through interviews with experts and an analysis of secondary sources. This twin track approach to identifying rural sites was used to build up a picture of sub-provincial rural Anhui in order to narrow down possible research sites. The research couples sending and receiving locations to add greater depth to the study. Shanghai is selected as the principle receiving location due to the high numbers of migrants it receives originating in Anhui (Poston and Zhang, 2008; Zhang, 2008) (see Figure 3-2 below).

An additional constraint to selecting research locations in China was the means through which approval and access was granted. The personal connections and networks of the Chinese academics supporting the research were vital to get permission to do the research and to enable the data collection to go ahead (Hvistendahl, 2013). Operating through more formal channels with a partner institution did ensure that, once a suitable site was located, permission to carry out research was almost guaranteed. However there were risks and drawbacks associated with this approach. Firstly, the reliance on the personal networks of Chinese collaborators had the effect of practically limiting the areas where the research could be conducted. Secondly, operating through official channels carried certain risks in terms of how the participants perceived the research, an increased potential of participation by coercion and an unwillingness to discuss issues that could be considered sensitive (see Hansen, 2006 for a more detailed discussion). Despite the just discussed potential issues, there

was no other feasible way of working and I felt that measures could be put in place to minimise or manage some of the more practical risks associated with conducting research in China under an official banner (see sections 3.2.3 on specific research instruments and 3.4 on research limitations and ethics).

Figure 3-2: Schematic to show case study approach differentiated by climatically driven environmental change and rural – urban location.



Research sampling

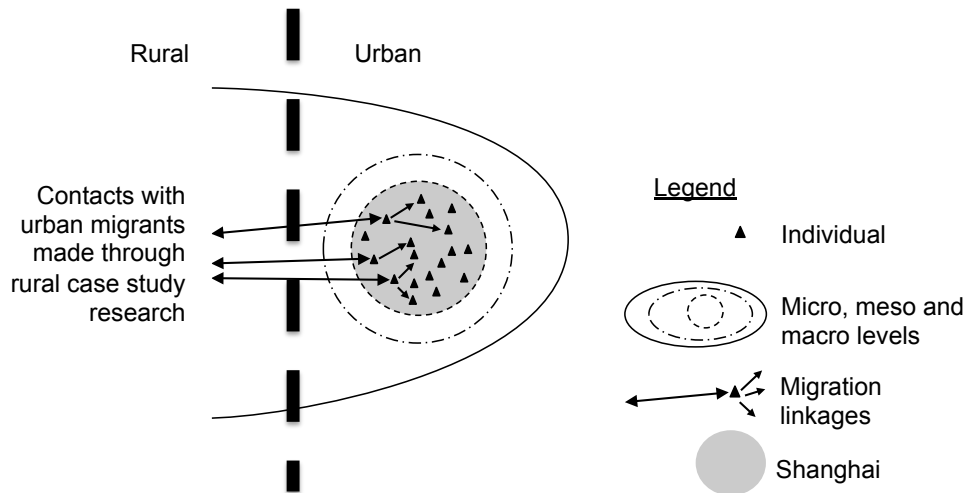
The rural sample frame was based on administrative boundaries of case study sites and ascertained through rural appraisal activities (Bilsborrow, 2009; Bilsborrow *et al.*, 1984). The sample is not selected to be representative of a larger population (the province for example) but will be representative of the case study population. In this sense the research can be conceptualised as an embedded case study approach whereby the different climatically driven environmental changes constitute the different cases and the qualitative migrant research represents the remote but embedded aspects (Yin, 2011). Yin (2011) makes the distinction between statistical and analytic

generalization. This study draws on this distinction and acknowledges that the ability to generalize will be derived analytically from links to existing theory to establish a logic that might be applicable to other situations. This differs from studies that are able to generalize based on statistically representative samples.

Sampling in rural areas depended on the research instrument employed. For group activities participants were selected on their availability or pre-selected following consultation with community leaders based on the type of exercise and issues to be discussed. Every household within the rural case study sites was included within the household survey (availability permitting). The survey requested the household head or wife / husband of the household head provide responses for the survey where possible. Should the household head or the wife or husband of the household head not be available another adult household member was asked to complete the survey. Surveys were often carried out in public places or in rooms with multiple members of the household present, as such some responses were provided by people other than the main respondent. Despite this, the views are considered to be representative of the household but not necessarily frank accounts of the perspectives of individuals within them. Participants for the semi-structured interviews in the rural areas were purposively selected based on criteria of interest that emerged through the initial analysis of the data in phases one and two and their availability. These interviews tended to be conducted in the participants homes and were often more private although other family members were often present.

The identification or tracing of an appropriate urban sample relied on the contacts made during the research in the rural locations (Bilsborrow *et al.*, 1984). During the rural appraisal activities and questionnaire survey work in the rural case study locations participants were asked to provide contact details for family members who have migrated to Shanghai during the period of interest (encompasses the environmental event) initially (although this was broadened subsequently to increase the potential sample). Permission was sought to make initial contact with the urban migrants through the family members in the rural location. Once this had been granted, arrangements were made to meet and interview the migrants in Shanghai. From this point, snowball sampling was used to identify other migrants, of which some came from the same natural villages (Dongdian and Wanzhuang) and all came from the same area (Figure 3-3 below). The urban sample was based on a non-probability snowball approach. This method is considered appropriate as the qualitative nature of this aspect of the research added depth to the quantitative rural case studies rather than providing generalizable information about a certain section of the population. Furthermore there is no accessible sample frame upon which to draw.

Figure 3-3: Diagrammatic representation of Initial contact and subsequent snowball sampling of urban migrants.



The unit of analysis depended on the research method employed (see Table 2-1 above and section 3.2.3 below for more information). The individual and the household were considered appropriate as the two main units of interest for this research in addition to the village as a whole. In migration research, the household context is seen as particularly important as the migration of individuals is often part of broader household processes that seek to manage risk and maximise opportunities in response to shifting systemic conditions¹⁷ (Bilsborrow, 2009; Liu, 2014; Nguyen and Locke, 2014; Stark and Lucas, 1988). In rural China, the household is considered the primary decision making body (Murphy, 2002) although this has become more complex as mobility has increased and the household can stretch to many locations at different points in time. Furthermore, households from the same family lineage often retain close cooperation. Despite these complexities, the household is still considered the most suitable analytical unit for this piece of research as it is the basic unit of production and consumption and different households do tend to live in different houses (De Sherbinin *et al.*, 2008; Murphy, 2002: 35).

Although the household was the primary unit of interest for the household survey, information was collected on each individual household member. Conversely, the individual was the unit of interest in semi-structured interviews in the rural case study sites although much of the information generated related to the household. In Shanghai, the unit of interest was almost exclusively focused at the individual level through interviews with migrant workers. I considered the responses generated through group

¹⁷ Regardless of the way in which the household is conceptualised. For example Stark and Lucas (1988) conceive of the household as a cooperative contractual model or a where as Liu (2014) conceptualises the household more in line with Sen's (1990) cooperative conflict model.

activities to be representative of the group as a whole (although I acknowledge that groups are made up of individuals with different perspectives).

3.2.3 Research methods

Rapid Rural Appraisal Techniques

Participatory methods evolved in development practice as a more bottom-up, quicker and cost effective means through which local people are able to articulate their problems, identify solutions and be empowered to implement them. The approach involves the active participation of local people to generate and reveal their knowledge about their livelihoods, history and problems for example, through participation in exercises or workshops from which plans of actions are developed that are suitable to the local community (Rademacher-Schulz *et al.*, 2012). Within this field the two most widely recognized and practiced types of appraisal method are Participatory Rural Appraisal (PRA) and RRA. Chambers (1997: 115) differentiates the two approaches by the mode, the role of the outsider, the information and methods employed.

For the purposes of this research, RRA techniques are used. My role, as a researcher, is more closely aligned to that of an investigator and, although the information will be disseminated to the community at points during the research it will be predominantly owned, used and analysed by me (an outsider). The distinction between PRA and RRA is important as it influences the perceptions and expectations of the participants. In RRA generally and this research (more specifically), the appraisal activities are not being carried out as a precursor to some development activity and, although the process might be empowering and result in increased awareness of the threats and possible responses to environmental (or other) change, the benefit lies primarily with the researcher. As such, it is vital to clearly communicate the aims and objectives of the research to the participants.

Table 3-2: List of RRA exercises undertaken in the case study sites.

Order of use	Name of activity	Activities and outcomes	Sample population
1	Social mapping with census	Develop an up-to-date social map of the case study area showing information on each household (number of members, gender balance, number of children for example). This process will help to identify key characteristics of the case study sites and help to ensure subsequent household survey captures households within a number of identified sub-groups (migrant and non-migrant households for example).	A large group of between 15 and 20 people drawn from people from a variety of backgrounds, identified through discussions with community leaders. Balanced participation of men and women.
2	Wellbeing ranking	Exercise to elicit information on the relative wellbeing of the different households and provide insight into the criteria used to evaluate wellbeing. Participants split the households into different categories of wellbeing based on their perception of individual household circumstances.	Approx. 5 adults from the case study area identified from the previous exercise; this group will consist of participants knowledgeable about the local area(s) and people. Balanced participation of men and women.
3	Resource mapping with transect walk	Develop a map of local resources showing major land uses types, cropping patterns, tenure, boundaries and ownership, and water sources and bodies of irrigation. Through the process of compiling and discussing the map a detailed picture of the natural resource conditions of the case study site will emerge. Once the map is completed a smaller group of people (drawn from the resource mapping exercise) will undertake a transect walk through the case study area to generate further discussion and demonstrate	A large group of between 15 and 20 people drawn from people from a variety of backgrounds, identified through discussions with community leaders. Balanced participation of men and women.
4	Historical calendar	Develop a historical timeline of the village to reveal key social, economic, environmental, cultural and demographic events and trends. This exercise provides key contextual information about the historical development of the village and helps to anchor subsequent research.	4 to 5 village elders: knowledgeable about the historical, social, demographic, economic and environmental changes in the village over the last 30 or more years. The group was identified through discussions with community leaders and insights generated from the Census and Resource mapping exercises. Exclusively men.

Table 3-2 (cont.): List of RRA exercises undertaken in the case study sites.

Order of use	Name of activity	Activities and outcomes	Sample population
5	Seasonal calendar	Elicit from the participants main weather conditions and changes in agricultural variables in the case study site before, during and after the flood or drought. This exercise focuses on the more recent time period (points in the last five or six years).	A group of 5 – 7 people (different from the previous activity) and knowledgeable about farming conditions. Exclusively men.
6	Causes and effects of migration	Discussion to identify the main causes and effects of migration in the local area to reveal key drivers and causal chains as perceived by the participants	Approx. 5 adults from the case study site identified from the previous exercises and through discussions with community leaders. Exclusively men.
7	Impacts of the flood / drought*	Exercise to identify the main impacts of flood or drought on the local area. The exercise will help to reveal to the pathways through which environmental change influences migration by investigating the impact of the flood or drought on livelihoods and mobility endowments and mobility entitlements.	Approx. 5 adults from the case study site identified from the previous exercises and through discussions with community leaders. Exclusively men.

*Not undertaken in Wanzhuang

Table 3-2 (above) details the RRA activities that were employed in the rural case study sites. The activities set down in the table have been identified from literature on RRA and their application in pre-existing, relevant research (see Goulden, 2006; Kumar, 2002; Rademacher-Schulz *et al.*, 2012). Taken together these methods served two main purposes. First, I quickly gained a good overview of the socio-economic characteristics of the case study sites and insight into the changes over time including the perceived drivers of these changes. Second, the activities provided a good opportunity for the residents of the villages to get to know the research team and vice versa; this proved invaluable in the latter stages of the research. Each activity followed a similar structure: the research team was introduced to the participants and the objectives of the exercise were explained (including issues of informed consent). Participants were able to ask questions and seek clarifications at this point. The exercise was undertaken and, at the end consent forms were signed and gifts or payment provided (for a fuller discussion on research ethics see section 3.4.2 below).

A considerable amount has been written about participation both positive and negative (see Chambers, 1997; Chambers, 2007; Cooke and Kothari, 2001; Kumar, 2002 for example). Kumar (2002: 35-38) identifies a number of criticisms levelled at PRA (also applies to RRA) activities including spatial biases, temporal and personal biases¹⁸. RRA activities can also be subject to elite capture or represent the views of powerful individuals rather than the group as a whole. Although it is not possible to negate these types of issues, awareness of them can help to reduce the extent to which they influence the research (although this is not always possible¹⁹).

The biases outlined above have the potential to impact upon the research and it was important to be aware of them during design, implementation and analysis. Some biases can be addressed more easily than others. For example, ensuring that sites are selected based on appropriately designed criteria rather than ease of access, involving different social groups in RRA activities and undertaking appraisal activities at times convenient for the participants helped to address the issues associated with spatial, personal and temporal bias. Others, such as seasonal and professional biases were less easy to tackle although certain steps were taken. For example approaches were used to record the agricultural variation over and within a number of years so the

¹⁸ This could include selecting locations that are easily accessible (spatial), visiting at specific times in the year that may misrepresent prevailing conditions or conducting business during office hours (temporal) or identifying with elite, male and active adults who are present (personal).

¹⁹ Two examples serve to illustrate this point. Firstly, although I attempted to ensure both genders were involved in the appraisal activities in the about half of the activities only men were present. Secondly, in one of the case study sites, the local village leader tended to dominate some discussions, particularly on agricultural topics on which he had a lot of opinions (an example of elite capture). At subsequent events in which he was involved, steps were put in place to manage the situation should he start to dominate proceedings.

seasonal nature was captured. From a personal perspective, reflexivity during the research process helped to keep professional biases, my culture and worldviews apparent and overt rather than hidden during the research (Mason, 2002).

The data arising from the RRA activities came in many forms that needed to be read together to ensure they were understood as holistically as possible. The exercises themselves often culminated in the production of some kind of output (a map, diagram, or, table) that provided useful insights into the case study sites. During the exercises themselves these tangible outputs would be used as a focal point for discussion. The topics discussed and opinions offered were incredibly valuable and have helped to frame all subsequent aspects of the data collection. The key points that arose through these discussions were recorded at the time in a fieldwork journal and have been subsequently written up to provide a detailed but abridged record. In addition, recordings were made of the activities; these have been transcribed into Chinese and subsequently translated into English. However, the reliability of these data are questionable due to the unverified transcription process (although it can be compared to the notes that I took during the activities themselves, it remains difficult to assess its veracity) and the poor quality of the recording. Subsequent translation has revealed that the transcriptions are not complete and substantial parts of the data are missing for some activities.

Household questionnaire survey

The household survey was one of the main sources of social data. The household survey was administered in the form of a face-to-face questionnaire in the dwelling of the respondent (predominantly). Questionnaires are a type of structured interview that helps to ensure standardization in both the asking and recording of responses. This standardization helps to increase internal validity (assuming that the instruments used to measure the concepts of interest are suitable) as the variation in responses is more likely due to natural variability rather than error (Bryman, 2008: 194).

The questionnaire was administered by a group of eight Masters' students (four male and four female) from Hefei University of Technology in Anhui. The students received one day's enumerator training to help ensure consistency in survey administration and to highlight the importance of some key ethical issues including informed consent, risk of coercion and awareness of potentially vulnerable individuals. During the training the students were given the opportunity to practice administering the questionnaire to increase familiarity and highlight areas where further guidance was required. The questionnaire data were predominantly quantitative although they did contain open questions that elicited some qualitative responses (recorded in note form by

enumerators). The questionnaire survey was split into three parts. The first part covered issues associated with environmental change and the impact of the weather event under study; the second part focused on migration and third part sought information on the household and its members.

For the purposes of this research, household members were considered to be those who usually reside and eat in the household (under one roof) whether they are registered or unregistered who have been living there for at least three months (or intend to stay for at least three months if a new arrival). This definition was adopted to capture those who work away for short periods of time but spend the majority of their time in the household but not those who work away for longer periods of time. Information on those staying away for longer was captured at other points in the questionnaire survey. The household survey was conducted with the head (or acting head) of the household or the wife or husband of the head where possible. Where the head or the wife or husband of the head was not available another adult member of the household was asked to participate in the survey. Information was also sought on absent household members: the enumerators requested that those with the most knowledge of the absentee completed this aspect of the questionnaire.

The sample frame for the survey was the entire resident household population of each case study site (the natural villages of Wanzhuang and Dongdian) developed through the RRA social census (provided a list of all households). There were 106 households in Wanzhuang of which 44 no longer held a *de facto* residence in the village. There were 124 households in Dongdian of which 43 no longer held a *de facto* residence in the village (20130414 RRA1DD and 20130430 RRA1WZ). The villages were divided into sections with pairs of enumerators allocated to each section. Two attempts were made to survey each household over the course of a three-day period after which no further attempts were made. 47 households were surveyed in Wanzhuang representing 38 per cent of the total number of *de jure* households or 76 per cent of the *de facto* resident households. 50 households were surveyed in Dongdian representing 40 per cent of the total number of *de jure* households or 62 per cent of the *de facto* resident households.

The questionnaire was developed drawing on multiple sources including initial analysis of the RRA activities, appropriate and existing research and other relevant literature, and input from experienced Chinese and UK social scientists (Australian National University *et al.*, 2009; Bilsborrow, 2009; Bilsborrow *et al.*, 1984; Rademacher-Schulz *et al.*, 2012; Vag *et al.*, 2009; Warner, 2011). The questionnaire was designed following initial exploratory research in the case study sites to help ensure that the questions

were relevant and sensitive to the local context. Specific attention was paid to the translation and operationalization of the key concepts such as 'environment' and 'migration' in an attempt to ensure that their meaning was clear and unambiguous (Jónsson, 2010; Warner *et al.*, 2009).

Two research assistants translated the questionnaire into Chinese whereupon it was quality assured by a senior researcher at Fudan University. A professional translator back translated the questionnaire to check that the meanings of questions had not shifted during the translation process. Where meanings had shifted, discussions were held to identify the most appropriate term to use. The initial version of the questionnaire was piloted by a research assistance with guidance from myself in a rural village in Anhui (different to the case study sites but with similar characteristics) to assess question design, content and inform on potential issues for enumerator training. Following feedback from the research assistant, the questionnaire was revised with any significant alterations undergoing another round of translation, back translation and quality assurance. The final version of the questionnaire was administered in the two case sites over the period of a week straddling the end of June and beginning of July in 2013.

Table 3-3 shows an outline of the questionnaire content (see Appendix 2 for a full version of the questionnaire in English and Chinese). The survey was split into three main modules and collected information on environmental change, its impacts and response, migration decisions and migration networks and the household. Proxy respondents were used to obtain information on absent members. Longer-term migration was defined as a move of three months or more or an intention to stay away for three months or more if the move is recent. This cut-off period accords with the definition in the Foresight Report and is often used as a cut-off point for distinguishing migration from short-term moves (Bell *et al.*, 2014; Foresight, 2011: 34). Shorter-term moves were defined as a period of more than one week but less than three months or an intention to stay away for less than three months if the move is recent. This period was selected to capture the more cyclical nature of moves present in the village and revealed through the RRA activities.

Table 3-3: Outline of questionnaire modules and content.

Module		Sub-module		Details of information collected
X	Metadata	X1	Meta-data	Details on the interviewee and interviewer
				Informed consent and quality assurance information
A	Environment	A1	Environmental change	Trends and changes in weather
				Impact of general changes in weather
		A2	Flood / drought	Impact on agriculture
				Impact on household
		A3	Coping and adaptation	Coping strategies employed
				Remittances
B	Migration	B1	Decisions and networks	Timing and use of migration by household during flood or drought
				Migrant networks and migration decision-making
				Drivers of and barriers to migration
C	Household	C1	Household roster	Demographic and social information on household members
		C2	Migration	Details on returnees and reason for return
				Details on shorter-term out-migration and reason for out-migration
				Details on longer-term absentees and reason for absence
		C3	Agricultural assets	Information on land, crops and other farming practices
				Changing household circumstances over time
				Household assets

Two reference periods were utilised in questionnaires in relation to the timing of migrant moves. For longer-term migration a retrospective 10-year window from the date of the survey was used as the cut-off point beyond which moves were excluded from the survey. For shorter-term migration a retrospective one-year window from the date of the survey was used beyond which movements were excluded from the survey. These time periods were selected for two main reasons. Firstly, the perceived ability of respondents to accurately recall the timing of longer-term and shorter-term moves respectively. Secondly, the longer time period was constrained by the timing of the flood and the need to generate a data series of suitable length.

The type of retrospective data collected through the questionnaire survey is subject to recall, proxy response and selection bias; steps were taken to minimize the impact of these error types. One of the biggest issues associated with retrospective surveying is the reliance on memory and the unavoidable inaccuracies that arise from recalling past events (Dos Santos and Henry, 2008). Steps taken to address this issue included limiting the recall period (especially for shorter term moves), anchoring events through

the use of community-derived calendars and significant national events²⁰, and triangulating with other sources of information derived from RRA activities (Dos Santos and Henry, 2008; Gray and Mueller, 2012).

Studying migration using the source area as the initial sample frame inevitably excludes the migrant as (s)he will have migrated out of the area. This issue is tackled through the use of proxy respondents who answer on behalf of the migrant. In this case, proxy respondents will primarily be the household head or selected on the basis of closeness of relationship with the target individual; it is assumed that the closer the relationship the more accurate the responses (Bilsborrow, 2009). Additionally a non-probability sample of migrants was included in the research via qualitative interviews and analysis. Whole households who have migrated and the deceased are excluded from the sample. This bias needs to be borne in mind when reading the analysis as the samples are drawn from a population that are currently not exhibiting mobility. In other words, the sample may present different characteristics than would have been the case had the research been conducted five or 10 years ago with populations that would subsequently leave the village.

In addition to the issues outlined above, there are more general issues associated with questionnaire surveys. These include response sets (responding consistently but not in relation to the concept being measured), acquiescence (respondents consistently agree or disagree with statements), social desirability (replying based on what they think they should say) and the problem of ambiguous meaning for key concepts (discussed previously) (see Bryman, 2008: 210-211 for a fuller description of these issues). These issues were actively considered during the questionnaire design and enumerator training to minimise their impact. Key terms were extensively tested to minimize ambiguity (the definition and description of wellbeing), positive and negative question formulations (identifying impacts of migration) were used to identify acquiescence and efforts were made through carefully phrased questions and enumerator training to avoid leading the respondent.

The data were subject to initial coding and input, a five per cent sample of the data were quality assured to check for accuracy. A similar approach was adopted for the qualitative aspects of the questionnaire data: the data were translated and input and five per cent were sampled for accuracy. Initial descriptive and exploratory analysis was performed on the data to generate tentative findings and further questions that required deeper analysis. Once the exploratory phase of the analysis was complete, I

²⁰ The 10-year time frame (2003 to 2013) accorded almost exactly with the leadership of President Hu Jintao and the Premiership of Wen Jiabao.

explored in more depth and expanded on the initial findings to draw more definitive conclusions with specific reference to my research questions (confirmatory analysis) (Robson, 2002). Due to the nature of the research questions and concepts that I used I developed a set of indices (drawn from the questionnaire data and informed through the qualitative data and its analysis) that I used to compare different sub-sets of my sample data (see section 6.3 and Appendix 3). For example, I investigated the impact of the flood or drought on households exhibiting different types of mobility behaviour to assess whether vulnerability and resilience differs between these groupings (Goulden, 2006; Hellebrandt Da Silva, 2010).

Semi-structured interviews

Semi-structured interviews were a key method through which I generated social data on individuals and, to some extent, households. The semi-structured interview was the most ideal interview type for this research as I needed to ensure some degree of consistency within the different groups of interviews to ensure comparability between cases (Bryman, 2008; Talwar, 2012). In total, I undertook six semi-structured interviews with migrants in Shanghai in phase two of the research and 12 interviews in the rural case study sites in phase three of the research. In addition to these interviews, I also conducted 32 semi-structured interviews in the exploratory phase of the research.

Semi-structured interviews provide a flexible means through which the interviewer and interviewee are able to discuss topics or issues, as they emerge set within a predefined structure. For all of the interviews I undertook, I had a pre-prepared list of topics that I wished to discuss but retained a high degree of flexibility within the interview itself (see also section 3.4). During the interviews I found that I frequently deviated from the interview guide as interesting lines of enquiry or topics emerged. Overall, I found this approach to interviewing to be very useful as I was able to tailor each interview to the interviewee rather than adhering to a rigid structure that did not allow room for novel conversations.

The semi-structured interviews with the migrants in Shanghai and the villagers in the rural case study sites afforded me the opportunity to really probe in detail on issues concerning migration, migration decision-making and the role of environmental change in migration decisions for example. The RRA activities provided me with a general overview of the rural case study sites and the household questionnaire provided me with predominantly quantitative data about people's lives and livelihoods. The semi-structured interviews afforded me the best opportunity to explore in depth the perceptions and experiences of and the decisions made by individuals. Through the interviews I really tried to understand how and why certain things happened.

The reliability and validity of data generated from the interviews in Shanghai and rural case study sites is good and I feel able to read more into the data compared to the RRA activities for example. A key reason for my confidence in these data results from the strong degree of control and influence I had over the data collection process and the lack of intervening issues. I undertook the interviews with support from one research assistant. Prior to each interview, I extensively briefed the research assistant and outlined the key lines of enquiry that I was interested in pursuing. This process was particularly useful as it enabled the research assistant to ask follow up questions within the general flow of the conversation. During the interviews I took extensive notes and, shortly after it was completed, recorded my impressions concerning the feel of the interview. I also discussed the interview with the research assistant to gain his / her insight into the responses and concerning the interviewee. I recorded the majority of the interviews and subsequently transcribed and translated the content. The translated transcriptions of each interview served two purposes: to check on the translation provided by the research assistant during the interview and to provide additional detail to my extensive notes.

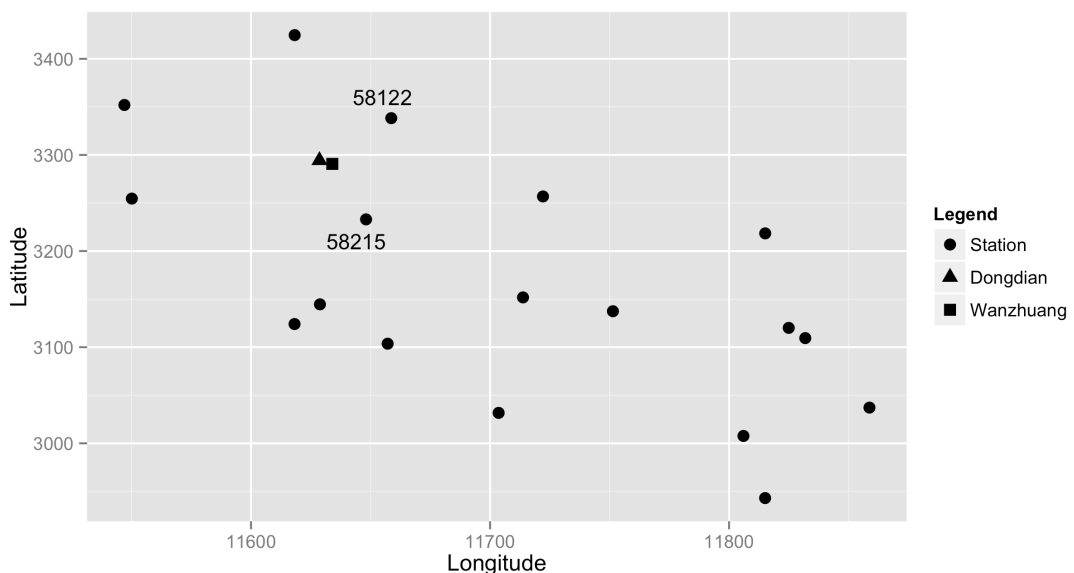
I adopted a phased approach to analysing the interviews. The initial coding was descriptive and literal and designed to help me to (re)familiarise myself with the data. This stage also helped me to begin creating the analytical and interpretative categories that I used in the second reading of the data. The second reading of the data enabled me to build up a more interpretive understanding of the data and identify themes, commonalities, unusual or anomalous issues that warranted further investigation. Lastly I looked reflexively at the data. As mentioned above, the robustness of the data is good in my opinion but there are a number of issues that I need to be aware in terms of their potential influence on the data generation and analytical process. The positionality of the interviewee and where they located the research assistant and me within their social understanding of the world influenced the responses that they provide. Similarly, my reading of them will influence how I perceive their responses and, to a certain extent, the way I asked and content of questions. Finally, the role and influence of my research assistant is a critical factor in the data generation process and must be taken in account during the analysis (for a fuller discussion on this matter see section 3.4.2 and also Tebboth (2014)).

Biophysical data

Data on rainfall and temperature was sourced from the Chinese Institute of Social Science for 18 weather stations in Anhui. Owing the variability of the climate and the dispersed nature of the weather stations in relation to the case study sites only the two

closest weather stations were selected for analysis (see Figure 3-4). Station 58122 was located approximately 80 km north east of the case study sites. The data series for station 58122 runs from September 1952 to July 2012, at monthly intervals for precipitation and temperature. Station 58215 was located approximately 60 km south east of the case study sites. The data series for station 58215 runs from January 1955 to July 2012 at monthly intervals for precipitation and temperature. The units of measurements for each site were 0.1 degrees Celsius for temperature and 0.1 mm for precipitation.

Figure 3-4: Plot showing the locations of the two case study sites and the 18 weather stations in Anhui Province. The two weather stations used in the analysis are indicated by the presence of station labels (58122 and 58215).



Fieldwork management

The data for this thesis was collected over an 18-month period and relied upon a large number of people and organisations. For the duration of my time in China I was a visiting fellow at Fudan University and was supported in my research by Prof. Peng Xizhe and Dr. Wu Kaiya. Over the duration of the research I used three different research assistants (determined by their availability) Chen Mengni, Tao Li and Wang YuanBo. The research assistants were selected based on their English language proficiency, experience of conducting social research and knowledge of issues related to migration. During trips to the field, Dr. Wu Kaiya and one of the research assistants always accompanied me. Whilst in China, I made a great effort to learn Mandarin and

was able to communicate in a rudimentary fashion when undertaking fieldwork²¹. My (lack of) language skills proved an invaluable tool to break down initial social barriers as my attempts at Mandarin provided a considerable source of mirth and amusement.

For each phase of the fieldwork I held a number of pre meetings to discuss the best approach and how to respond if certain scenarios played out. During the fieldwork itself and preceding each research activity, I arranged meetings to discuss the intended outcome and proposed approach. During these meetings concerns and adjustments to the research instrument were made based on the insight and experience of the Chinese members of the research team. At the conclusion of each activity an evaluative meeting was held that provided a forum to discuss how the research activity was perceived and any issues that arose. The output of the evaluative meetings was used to inform the implementation of subsequent research activities.

More generally, during the fieldwork process I encouraged all members of the research team to observe and contribute to the research process. I took detailed notes and recorded observations, feelings and experiences. Keeping a fieldwork journal was very useful and helped me to order my thoughts, understand and reflect on events, and provided an excellent aide memoir to put me 'back in the moment' months after it occurred. The journal was also a safe space to vent feelings of frustration and anger as well as record the highs that inevitably come with intensive work in the field.

Payment to research participants was made under the advice of my Chinese collaborators. Payments of between 20 and 80 RMB²² were made to participants depending on the level and nature of their involvement. Sometimes gifts such as fruit or umbrellas (strangely) were provided if that was considered appropriate.

3.2.4 Analytical approach

Although I approached the data analysis in two strands according to the data type, I tried to keep an overall picture of the data at the forefront of my mind. I achieved this by adopting an iterative approach and using the different types of data and emerging themes to inform my analysis of the other type of data as I moved between them. This enabled me to test ideas developed through my qualitative analysis of interview data with my quantitative survey data for example. Conversely, descriptive analysis and statistical tests on my quantitative data could be critically interrogated using my qualitative analysis. The qualitative analysis and data collection provided a useful

²¹ The inhabitants of the rural case study sites spoke *Anhuihua* and the migrants in Shanghai spoke *Anhuihua* or *Shanghaihua*. All of the participants were able to understand Mandarin.

²² Renminbi (RMB) is the official currency of the People's Republic of China, also known as Yuan. As a rough approximation 10 RMB is equivalent to 1 GBP.

check and helped inform how much I read into my quantitative data in terms of reliability and robustness (Robson, 2002).

Writing up my research followed a similar pattern to that outlined above. I planned in some detail the main points I wished to communicate in each of my analytical chapters based on my initial reading of the data and then identified the most appropriate data to support the points I wished to make. This approach helped to ensure I was able to integrate different strands of data within the analysis by adopting an issue-led structure. As a result, I was able to carry through the interdisciplinary focus in the analysis that I employed in my research design and implementation.

Qualitative data

Data were coded at the literal or descriptive level to draw out the main points that were covered through the research activity (Mason, 2002: 149). This coding process, undertaken using Nvivo, increased familiarization with the data and permitted quick retrieval of specific subsets of the data, helped me to understand the content of the data and enabled me to begin the process of analysis. I envisaged this part of the analysis as the process that enabled me to begin to transform and reconceptualise the data, raise questions and queries within and about the data and provide tentative answers about relationships between different parts of the data (Coffey and Atkinson, 1996). The coding process was undertaken with reference to the other forms of data that were generated through the research process and helped provide a more rounded picture. The reconstructing the data collection process in my mind contributed to a more holistic reading of the data that, I hope, has reduced the risk of it being taken out of context or misread due to poor or inaccurate transcription and translation for example.

Once the initial, literal coding was completed I undertook a more interpretative coding of the data (Mason, 2002). This process drew on the other sources of data that have been generated and was used to start building a deeper understanding of what the data says. For example, I generated different lines of enquiry that required further investigation and thought or speculated on the presence of certain relationships (Coffey and Atkinson, 1996). During the entirety of the coding and deeper analytical work I was aware of a number of issues that affected how I read the data. The methods of data collection, my positionality vis-à-vis that of the participants, and the role of the other members of the research team (particularly Dr. Wu and my main research assistant, Chen Mengni) were important considerations and influenced the data generation and analysis.

I tried to determine the likely impact that the influences mentioned above have had and what it means for the data. This more reflexive reading is a key aspect of the analysis and helps to identify my role in the 'process of generation and interpretation' (Mason, 2002: 149). Additionally, certain stages within the process of generating data lead me to question the reliability and validity of some of the data produced. These issues, concerning the reliability and validity of the data, required careful consideration and handling to ensure that the overall quality and rigour of the research is not harmed.

Quantitative data

Analysis of the quantitative data was undertaken in R. The initial phase of the data analysis was exploratory and mainly descriptive and used to familiarise myself with the data. In this stage of the analysis I used a number of simple descriptive techniques and plots to quickly summarise the data to enable me to identify patterns or anomalies. Once I had completed the initial exploration of the data, the analysis focused on issues and questions that were of interest. Specific statistical techniques were used in accordance with analytical needs and the type of data I was handling.

Data derived from the household survey was processed and subjected to a number of different types of analysis and statistical test to assess for patterns, anomalies, correlations, and significance. In developing the asset index (used as a proxy to assess wealth), Principle Component Analysis was used. At higher levels of analysis the sample sizes of specific groups (differentiated by mobility type for example) was often small (less than 10). Where small sample sizes are present I have been cautious to not read too much into the data and tended towards a view more akin to a qualitative approaches rather than considering the data as representative of a broader population. The biophysical data (temperature and precipitation) was analysed with time series packages in R to identify long-term trends, seasonal averages and anomalies for example.

3.3 Research sites

In this section I will briefly describe the main socio-economic, biophysical and hydrometeorological characteristics of the two case study sites (Dongdian and Wanzhuang) including the two climatically driven environmental perturbations under study.

3.3.1 Provincial context for the research

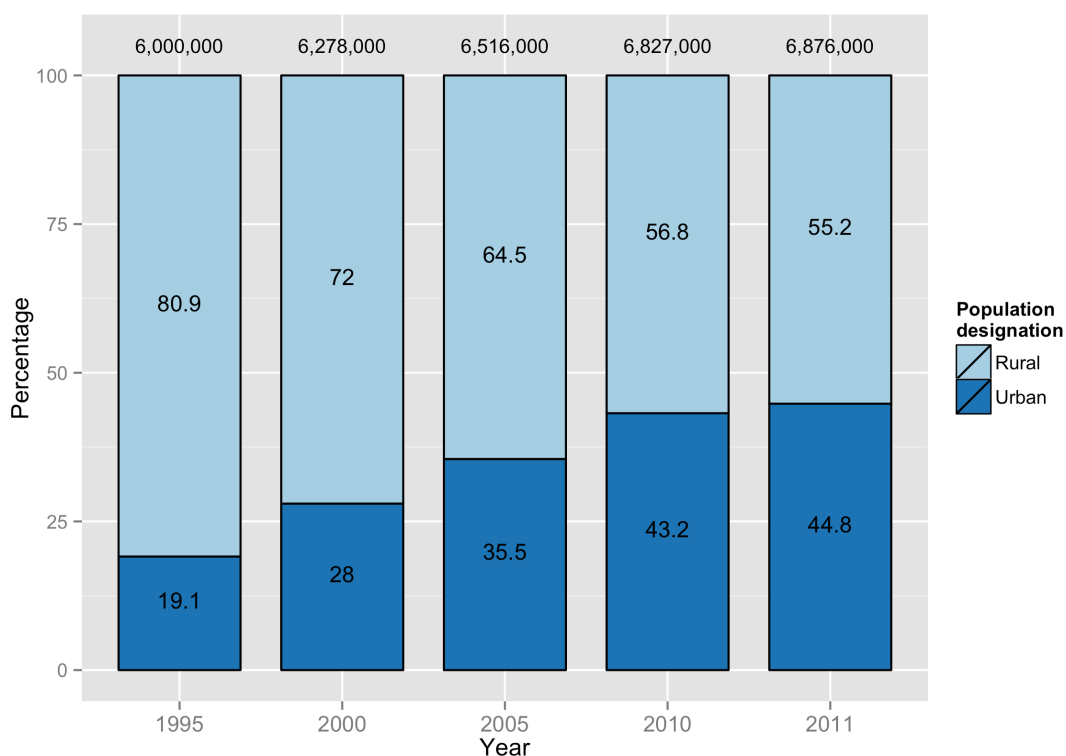
The research is located in Anhui Province, China (see Appendix 4 for background information on China and Appendix 5 for some comparative economic data on individual prefectures in Anhui). Despite its proximity to the rapidly developing Eastern seaboard, the majority of Anhui's population are still classed as rural (see Figure 3-6) suggesting that agriculture remains an important livelihood for a substantial proportion of the population²³. In 2011, 55.2% per cent of the population lived in rural areas, a decrease from 80.9 per cent in 1995 (China Statistical Press, 2012). Although the proportion of the population living in rural areas has decreased substantially since 1995, Anhui remains the most rural province in Eastern China, in the top third of all provinces in China and with a greater proportion of rural inhabitants than the average for China as a whole (China Statistical Press, 2013).

Figure 3-5: Map of China showing the provincial administrative boundaries (D-Maps, 2014b).



²³ In his study Zhang (2011) uses percentage of people living in rural locations as a proxy for farm dependence.

Figure 3-6: Percentage of population living in rural and urban areas in Anhui in 1995, 2000, 2005, 2010 and 2011 (data derived from Anhui Statistical Yearbook (China Statistical Press, 2012: 1-4))*.

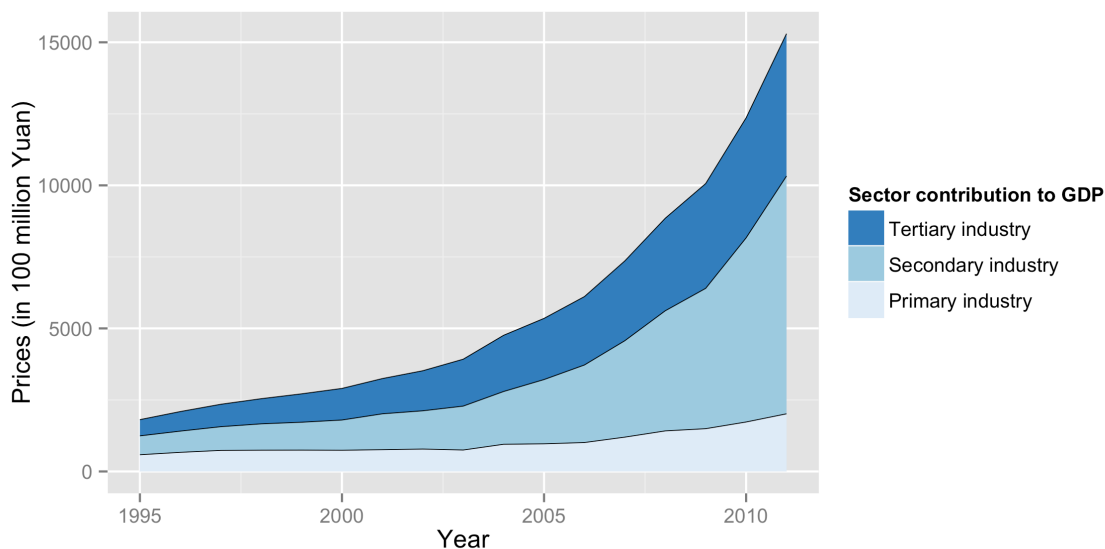


*Total population given for that year above each bar; note non-linear scale in x-axis.

The decreasing share of the population classed as rural is reflected in underlying changes to the structure of Anhui’s economy. In 1995 primary, secondary and tertiary industries²⁴ each contributed an approximately equal amount to GDP (see Figure 3-7); by 2011, the relative contribution of the three sectors has changed significantly. Primary industries contribution to overall GDP had decreased from 32 per cent to just 13 per cent whereas the contribution of secondary industries had increased from 36 per cent in 1995 to 54 per cent in 2011. Tertiary industries contribution remained relatively static over the equivalent period. The changes to the population (a gradual rural to urban shift) and away from agriculture mirror the broader changes in China as the country develops.

²⁴ Definitions of primary, secondary and tertiary industry are taken from the Anhui Statistical Yearbook 2012 Explanatory Notes for Major Statistical Indicators for Chapter 2: National Accounts (China Statistical Press, 2012). Primary industry is agriculture (including farming, forestry, animal husbandry and fishery). Secondary industry is all industry (including mining and quarrying, manufacturing, production and supply of electricity, water and gas) and construction. Tertiary industry is all other industries not included in primary or secondary industry.

Figure 3-7: Anhui Gross Domestic Product by sector for series 1995 to 2011 (data calculated at 2011 prices). Data for 1995 and 2000 to 2011 derived from Anhui Statistical Yearbook 2012 (China Statistical Press, 2012: 2-1), data for 1996 to 1999 derived from Anhui Statistical Yearbook 2009 (China Statistical Press, 2009: 2-1).



Notes:

Primary industry: agriculture (including farming, forestry, animal husbandry and fishery).

Secondary industry: industry (including mining and quarrying, manufacturing, production and supply of electricity, water and gas) and construction.

Tertiary industry: all other industries not included in primary or secondary industry.

Anhui is the second largest (only Sichuan is larger) exporter of migrants, recording a net out-migration of 11,108,000 people over a 20-year period (1990 – 2010) for the population aged five and above (Chan, 2012)²⁵. This represents 7.8 per cent of the nations total interprovincial migration over the aforementioned 20-year period. The volume of out migration has been increasing throughout the four five year periods (see Table 3-4) with the largest jumps occurring in 1990 – 1995 and 2005 – 2010. Over the four five year periods, Anhui is always ranked in the top three for net exporting provinces indicating stability in trends between exporting provinces.

²⁵ The figures presented form the analysis by Chan (2012) and the conclusions drawn from them should be regarded with a degree of caution owing to the well documented issues with data reliability in China, this is particularly the case when dealing with undocumented or floating migrants.

Table 3-4: Net interprovincial migration in Anhui from 1990 to 2010 for population aged five and above (derived from analysis by Chan (2012)).

Period	Net interprovincial migration*
1990 – 1995	-662,000
1995 – 2000	-2,579,000
2000 – 2005	-3,165,000
2005 – 2010	-4,702,000
1990 – 2010	-11,108,000

* Data counts moves so individuals can be counted more than once if they moved more than once in those four five year periods.

In sum, Anhui can be characterised as having a large labour surplus and a corresponding long history of out-migration. The majority of the population are rural although this has decreased substantially since the mid-1990s. Economically, the province has developed its secondary industries and the relative contribution of agriculture to Anhui GDP has decreased. Wang and Fang (2006) attribute the low levels of economic development (relative to other proximate provinces) and the large, unskilled rural population as key reasons that explain Anhui as a major exporter of migrant labour.

The case study sites are located within Lixin County, one of four counties that constitute Bozhou prefecture, Anhui (see Figure 3-8). Bozhou has the least educated population in terms of number of years of schooling attended and the third highest rate of illiteracy at a prefecture level in Anhui (9.12 per cent) (China Statistical Press, 2012: 3-8 & 3-6). In 2011, Bozhou reported above average levels of temporary migration (defined as leaving for six months or more but not changing registration), with 35 per cent of the population taking this decision (the average the Anhui is 31.35 per cent). Of these, 82 per cent relocated to other provinces with the majority going to Jiangsu (20 per cent), Zhejiang (35 per cent) and Shanghai (33 per cent) (*ibid*, 2012: 3-21 & 3-22).

Figure 3-8: Map of Anhui showing the prefecture administrative boundaries (d-maps, 2014a).



Bozhou Prefecture was selected as a suitable location for the research (from a socio-economic perspective) owing to its low level of economic development, high levels of poverty, a majority rural population and a continued reliance on agriculture for livelihoods. Past migration is an important determinant of future migration (see section 2.1) and Bozhou prefecture has high levels of pre-existing migration. This characteristic, of existing migration, enables me to explore the impacts of environmental changes driven by climatic variability within a region that has strong traditions of migration. As sites of existing migration are often the source for future migration, the research

provides insight at probable locations of future migration under conditions of environmental change (Bardsley and Hugo, 2010; Hugo, 2012).

3.3.2 Socio-economic characterisation of case study sites

The Village of Dongdian is classified as a natural village and part of Qianwei Administrative Village. Qianwei Administrative Village belongs to Xinzhangji township administration within Lixin County. The village is located approximately 7 km (as the crow flies) from the nearest town, Kantuanzhen (small local town), and 24 km from the Lixin, the nearest County Town. The village contains approximately 124 houses although a substantial number (approximately 35 per cent) of these are empty owing to sustained out-migration (20130414 RRA1DD). Wanzhuang, a natural village like Dongdian, is part of New Hexie Administrative Village and belongs to Zhangou Xiang, within Lixin County. The village is south of Dongdian and located 11 km from the nearest town (Kantuanzhen) and 28 km from Lixin. The village contains approximately 106 houses (slightly smaller than Dongdian) of which a large number are empty (approximately 42 per cent) (20130430 RRA1DD). Significant improvements to the villages' infrastructure have occurred within the last 20 years. Both villages now have near universal access to potable water, are electrified and witnessed improvements to the road network (from mud to concrete) (20130416 RRA4DD and 20130502 RRA4WZ)

The economy of both villages relies predominantly on agriculture, with the majority of adults in both sites who work describing their main activity as farming (see Figure 3-9). Three main crops are grown in both case study sites: wheat, corn and soya in a double cropping agricultural cycle. Wheat is planted in September and harvested in early summer. Corn and or soya is planted in the summer and harvested in August. In Dongdian (n=50), the average size of total landholding is 8.91 mu²⁶ compared to 8.35 mu in Wanzhuang (n=47); this is slightly above the average of 7.5 mu for rural China (Yan *et al.*, 2014: 304). Households in Dongdian tended to farm fewer but larger plots on average compared to Wanzhuang (see Table 3-5). Plot ownership was predominantly in the form of long-term contracts although there was a small degree of informal (non-cash) exchange agreements between households to farm under used land of absent households. This type of arrangement was more common in Wanzhuang than Dongdian, particularly for households that owned two or more plots.

²⁶ 15 mu equals approximately 1 hectare.

Figure 3-9: Reported main livelihood activity for adults that stated or were reported as working.

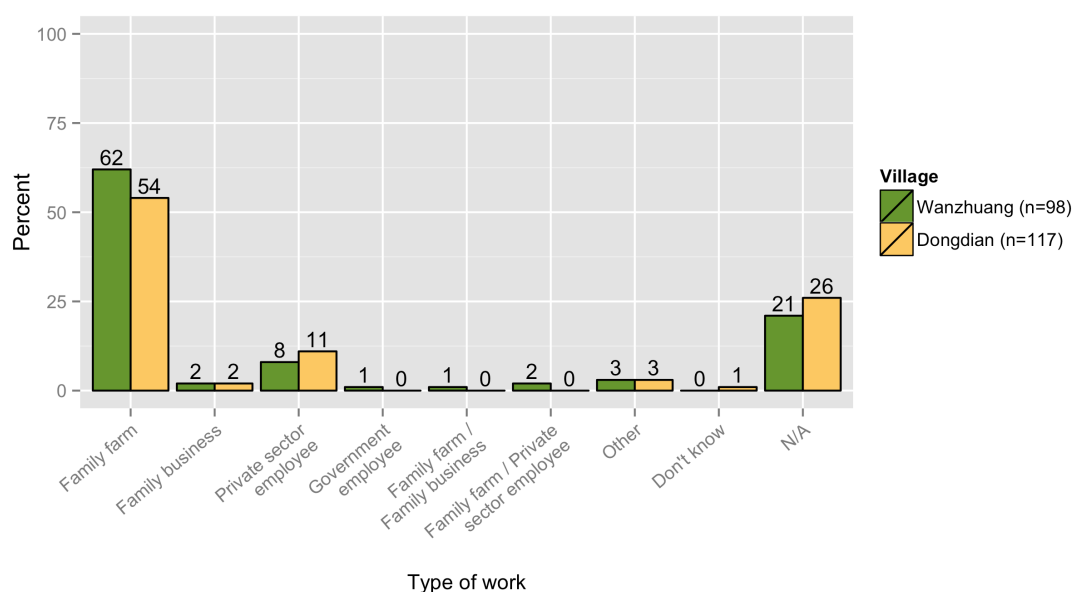


Table 3-5: Average plot size and average number of plots per household for Dongdian and Wanzhuang.

	Dongdian (n=50)	Wanzhuang (n=47)
Average plot size (in mu)	5.7	3.9
Average number of plots	1.6	2.2

As well as farming, some households in the case study sites also practiced animal husbandry. In Dongdian (n=50), 60 per cent of households reported owning livestock compared to 53 per cent of households in Wanzhuang (n=47). The most common types of livestock were chickens, fowl and goats. Income from remittances also contributed to household incomes in the two case sites. Survey responses show that 50 per cent of households in Dongdian and 61 per cent in Wanzhuang receive remittances (at the time of the survey) highlighting their importance to the household economy (particularly for Wanzhuang) (Cong and Silverstein, 2011; Murphy, 2002).

Underemployment is acute and there are no significant livelihood options outside of the agricultural sector although this has not always been the case. A brick manufacturer was located in Wanzhuang from 1963 and provided significant employment for the village population and that of the surrounding area. The factory closed down in 1995 and removed the one significant, local source of non-agricultural employment. Participants in the rural appraisal activities indicated that the closure of the brick manufacturer was a significant factor in the young people leaving to seek work outside.

Since the closure of the factory there have been no significant major employers in the Wanzhuang²⁷ or Dongdian.

In the two case study sites the majority of the resident sampled adult population held a local, agricultural *Hukou*²⁸. The *Hukou suozaidi* indicates location of registration, the majority of respondents held a local registration indicating they were born in the locality (owing to the difficulty for poorer sections of society to change their place of *Hukou* registration). This finding is confirmed by response to another question asking about place of birth. For Dongdian (n=117), 94 per cent of the respondents stated they were born locally and only 4 per cent indicated that they were born in another province. The remainder stated they were born within Anhui but not locally. For Wanzhuang (n=98), 95 per cent of adults included in the household survey stated that they were born locally and only 1 per cent was born in another province. The second classification (*Hukou leibie*) refers to a person's status and is either agricultural or non-agricultural. For both sites, 95% of residents had an agricultural *Hukou* (n=225).

Flood and drought vulnerability

Dongdian (26m asl) and Wanzhuang (26m asl) are located in the low-lying plains of the Feihe River, a tributary of the HuaiHe River. Both villages have little infrastructure to cope with floods or droughts. The Feihe River (runs north to south and marks the eastern boundary of Dongdian and Wanzhuang) constituted a major flood risk until a levee was built along its the banks²⁹. Low-lying farmland (located towards the Feihe) is particularly vulnerable to surface water flooding or ponding with villagers in Wanzhuang reporting that a day's worth of rain cause will cause the area to flood (20130501 RRA3AWZ). In both villages, the main roads also act as levees protecting parts of the settlement areas from surface water or fluvial flooding.

Dongdian does not have any significant infrastructure to cope with drought. Agriculture is predominantly rain-fed with some man-made ponds and irrigation ditches used to retain water after the rains and help remove surface water during sustained bouts of heavy precipitation. During dry spells, the villagers reported renting pumps to move water to where it is needed. There are no tube wells in the village with which one can irrigate the communal farmland; the majority of houses have mechanical / hand pumps to draw underground water for personal use. In Wanzhuang, there is no significant

²⁷ In 2011, a chicken farm opened in Wanzhuang although it did not employ a significant amount of people and the stock of the farm was destroyed in 2013 following a Bird flu outbreak in the wider region.

²⁸ *Hukou* classification is divided into two types. The first classification is the *hukou suozaidi* (the place of *hukou* registration), based on a person's presumed regular residence and is either rural or urban. The second classification, *Hukou leibie*, is based on status or type of *Hukou* and is either agricultural (*nongye*) or non-agricultural (*feinongye* or *chengzhen*) (Zhang, 2011).

²⁹ Date of construction is unknown although it was certainly prior to 2003 and probably much longer ago.

flood control and irrigation infrastructure beyond some basic ditches and run-off channels. Most of the drainage ditches were built in the 1950s and 1960s as part of Mao's modernization drive. The drainage infrastructure has been maintained and improved over the years and the most important channels have been deepened and widened recently (for example the ditch to the east of the settlement was improved in the year prior to the RRA activities).

3.3.3 Characterising the weather events under study.

In June and July 2007 the HuaiHe River valley (includes the provinces of Hubei, Henan, Anhui and Jiangsu) suffered from a number of heavy rainstorms associated with the Meiyu front³⁰ or plum rains. The persistent and heavy rainstorms in 2007 caused substantial flooding in the region and resulted in estimated economic impact of more than 10 billion RMB. 1.35 million hectares of crops were affected, of which 0.51 million hectares were destroyed. Anhui was particularly hard hit: more than 15 million people were affected in 89 counties with thousands evacuated from their homes (Ding *et al.*, 2013; Zhang *et al.*, 2010). The flood in 2007 was the latest in a sequence of severe floods³¹ that have resulted billions of RMB of damage, affected millions of people and caused substantial losses in the agricultural sector (Zhang and You, 2014).

In 2007, the flood affected the vast majority of farmland and a substantial proportion of the village itself. The flood impact was not exceptional for Wanzhuang: the village has a history of flooding and villagers recalled additional flood events in 2003 and two in the 1990s³², in addition to the one in 2007 (20130502 RRA4WZ). The description of the three most recent (and memorable) flood events highlight how vulnerable the village is to surface water flooding and the comparative severity of the floods (20140203 Interview Wang Bao-Zhi; 20140302 Interview Wang Zhou; and 20140204 Interview Wang Chung). The impact of the flood in 2007, although substantial, was not as severe in relation to the floods in 2003, 1998 and 1991. However, the amount of precipitation recorded in July 2007 at local weather stations³³ was the highest recorded anomaly since 1982 for station 58215 and was only exceeded twice in the history of the precipitation records for station 58122 (in 1954 and 1965).

³⁰ Persistent stationary front that runs east to west through central China for approximately two months and is responsible for the summer rainy season during which time the majority of the precipitation occurs in Anhui.

³¹ Prior to the flood in 2007, severe flooding also occurred in 2003 and 1997 (Zhang and You, 2014).

³² There was some confusion as to the years the floods occurred in the 1990s. The general consensus was one flood occurred in 1991 or 1992 and the other flood occurred later in 1997 or 1998. Biophysical data shows anomalies for both time periods.

³³ The two closest weather stations were used in the analysis and are approximately equidistant from the case study sites.

The flood required the evacuation of the village for about one month during which time the residents lived in a temporary camp on the main highway. The government provided food and shelter for each household and implemented a number of measures to reduce the likelihood of disease outbreaks. This support included the provision of drugs to minimize the prevalence of communicable diseases, management of sanitation to reduce the risk of water-borne diseases and health check-ups. During the relocation, the villagers did not have any means to support themselves or earn any income from the farmland, as it was inaccessible. In the aftermath of the flood, the government provided the villagers with small amounts of money and crops for eight months to aid recovery.

Dongdian experienced below average rainfall since the summer of 2010 when the summer monsoon failed to materialise³⁴. The drought in Dongdian, although not severe in terms of its duration and extent, has affected the development of the wheat crop through the absence of precipitation at crucial points in the crop growing cycle (Challinor *et al.*, 2009). The wheat crop is grown through the driest part of the year (September to June) where even small variations in the amount of precipitation have a significant impact. Analysis of weather station 58122 data for the September to May period reveals that the 2010-2011 period has the third lowest amount of precipitation since records began. RRA activities bear out this finding. An RRA exercise that explored the relationship between weather and agriculture showed reduced yield in the summer of 2011 for wheat and low crop water availability from the beginning of 2011.

Contextualising the weather events

As described above, biophysically the flood in 2007 was the largest flood since 1954 in the upper and middle reaches of the Huaihe River Basin (Ding *et al.*, 2013; Zhang *et al.*, 2010). However, evidence from the impact of the flood on the village of Wanzhuang suggests it was not as severe as previous floods that have occurred in 2003 and in the 1990s. Figure 3-10 and Figure 3-11 (below) use a 12-month moving average to explore the variability in precipitation from 1990 to 2012. The seasonal breakdown shows that the majority of the precipitation falls in June, July and August with the driest months occurring in December, January and February. Both sites show considerable variation especially in the summer months when the majority of the precipitation occurs. For 2010 and 2011, the precipitation data show a decrease in three out of the four seasons (the exception being the summer months), which could impact upon winter crops. However, this period, from 2010 onwards, does not appear particularly severe in terms of its extent or duration.

³⁴ Dongdian was at the northern extreme of a large drought affected that huge swaths of the middle and lower reaches of the Yangtze (Zhang, Qingfeng. *et al.*, 2012).

Figure 3-10: Long term annual and seasonal average precipitation from 1990 to 2011 for station 58122.

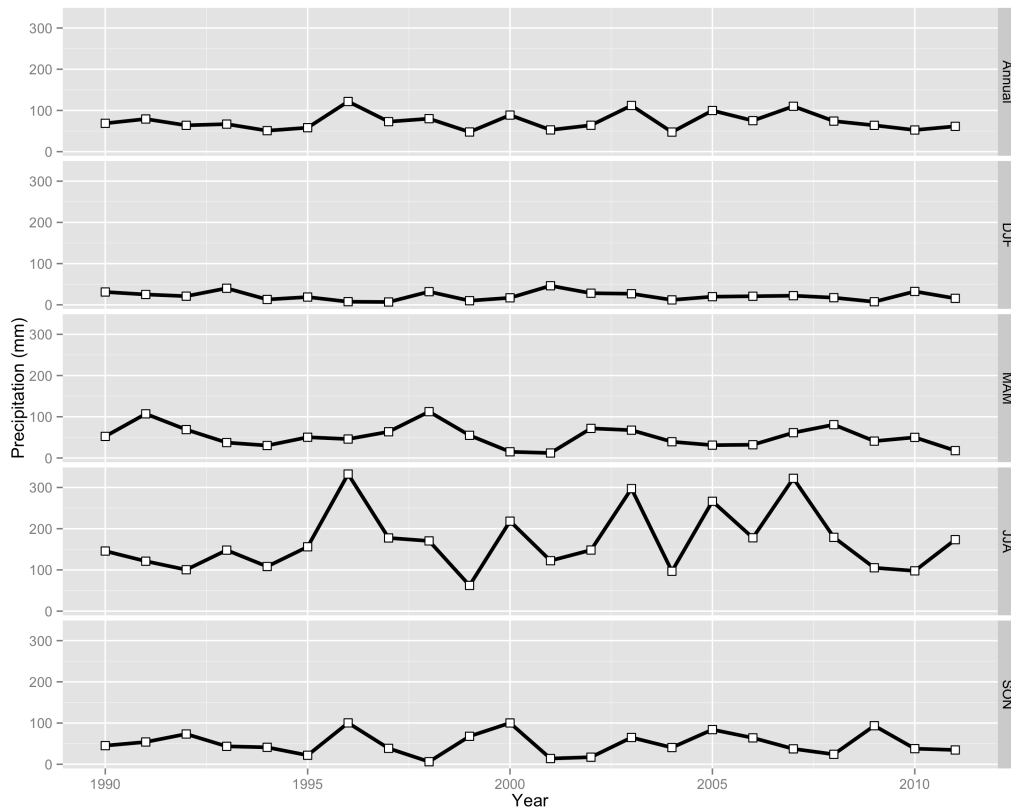
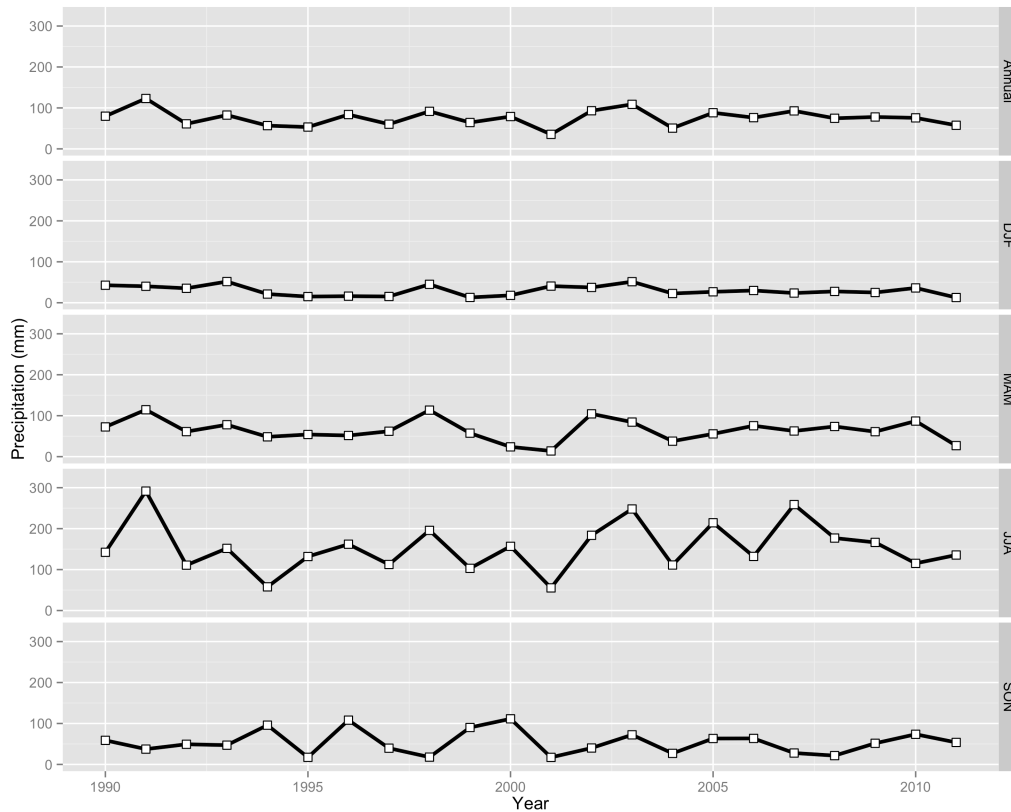


Figure 3-11: Long term annual and seasonal average precipitation from 1990 to 2011 for station 58215.



During rural appraisal activities the timing of (the absence of) rainfall within the growing season was highlighted as a key factor mediating the impact of a drought event. For example, one participant in a rural appraisal exercise reported that ‘the current drought is affecting the wheat yield; there has been no rain for 30 days and it is getting critical. The plants are already stunted and the harvest is due in about a month’ (20130417 RRA7DD). This quote highlights the importance of the timing of the rainfall in the crop growth cycle³⁵. Analysis of the precipitation data series for the years ending in September more accurately reflects the volume of precipitation occurring during the agricultural growing seasons. Data for station 58122 shows that the last four years (up and including 2011-2012) have been below average with the 2010-2011 season the third driest on record. Station 58215 records below average precipitation for two of the last four years with the 2011-2012 season the eighth driest on record.

Figure 3-12 and Figure 3-13 show deviations about the mean from 1990 to 2010 and better captures periods of heavy precipitation³⁶. Three distinct positive anomalies are evident in the plot for station 58122 corresponding with two (1997/1998 and 2007 but not 2003 or 1991/1992) of the four reported flood events in Wanzhuang and or Dongdian. The anomalies themselves represent an increase in precipitation of more than 200mm from the mean and show the 2007 event to be most severe based on precipitation data alone. Interestingly the data for station 58215 replicates the anomaly in 2007 but not in 1997. Furthermore, two additional anomalies are included in years 2003 and 1991. Looking at both sets of data, the reported flood events in 1991/1992, 1997/1998, 2003 and 2007 are represented although only the 2007 event is evident in the data from both stations (emphasising the geographical extent of the precipitation for that year). Both stations also show an anomalous reading for 2000 although this did not result in flooding in either of the two case study sites.

³⁵ For example, conditions during anthesis are crucial (Challinor *et al.*, 2005; Deryng *et al.*, 2014).

³⁶ Data series only extends up to the end of 2009 as a result of the data processing required to calculate deviations about the mean. To calculate the five year moving average two values taken from either side of any year (from which deviations for each year were derived). As a result, deviation data only extends up to the end of 2009.

Figure 3-12: Monthly deviations about the mean from 1990 to 2010 (mean based on 5-yearly mean for each month from 1988 – 2012) for station 58122.

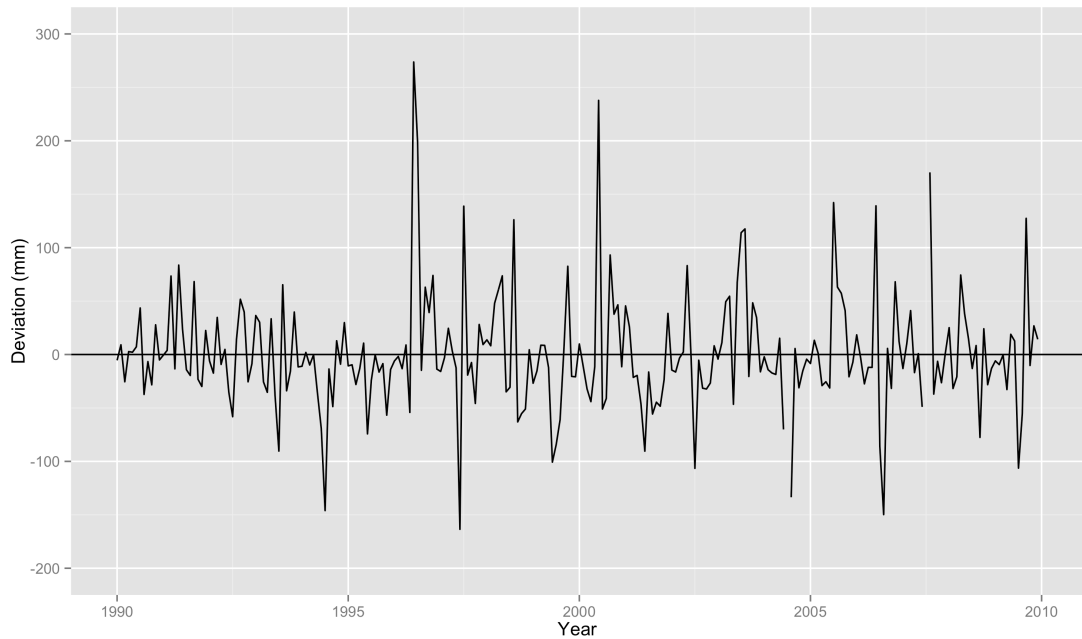


Figure 3-13: Monthly deviations about the mean from 1990 to 2010 (mean based on 5-yearly mean for each month from 1988 – 2012) for station 58215.

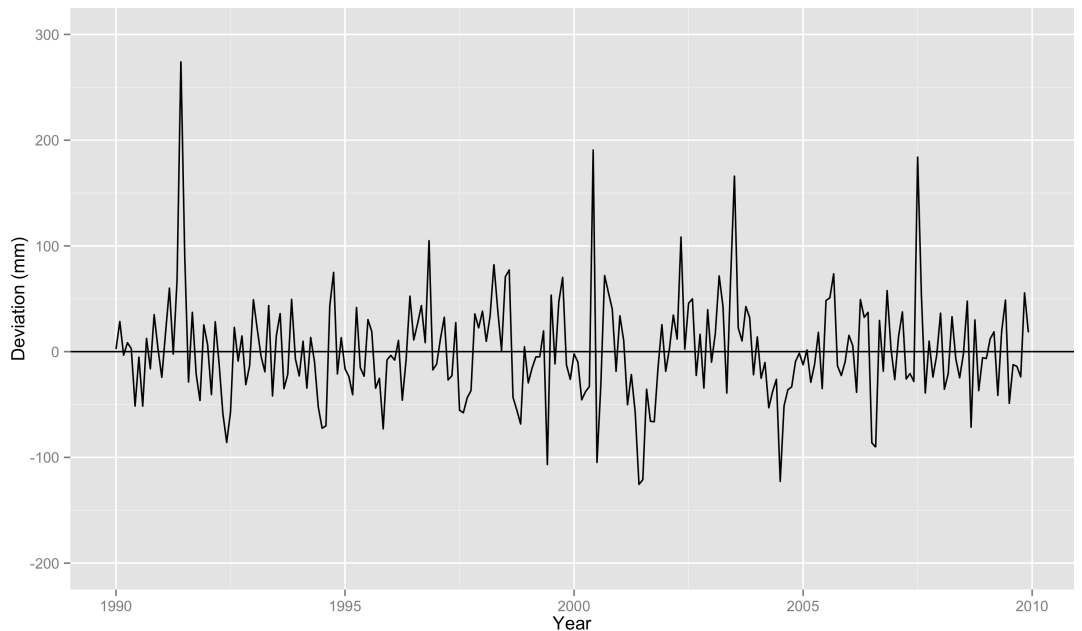


Figure 3-14 and Figure 3-15 show the annual mean, maximum and minimum temperature for sites 58122 and 58215 over a 21-year period from 1990 to 2011. The homogeneity between the two sites indicates that there is much less spatial variation between the weather stations for temperature (especially when compared to the precipitation data).

Figure 3-14: Annual T_{max} , mean and T_{min} temperature data (in degrees Celsius) from 1990 to 2011 for station 58122. Red line shows the mean for each data series.

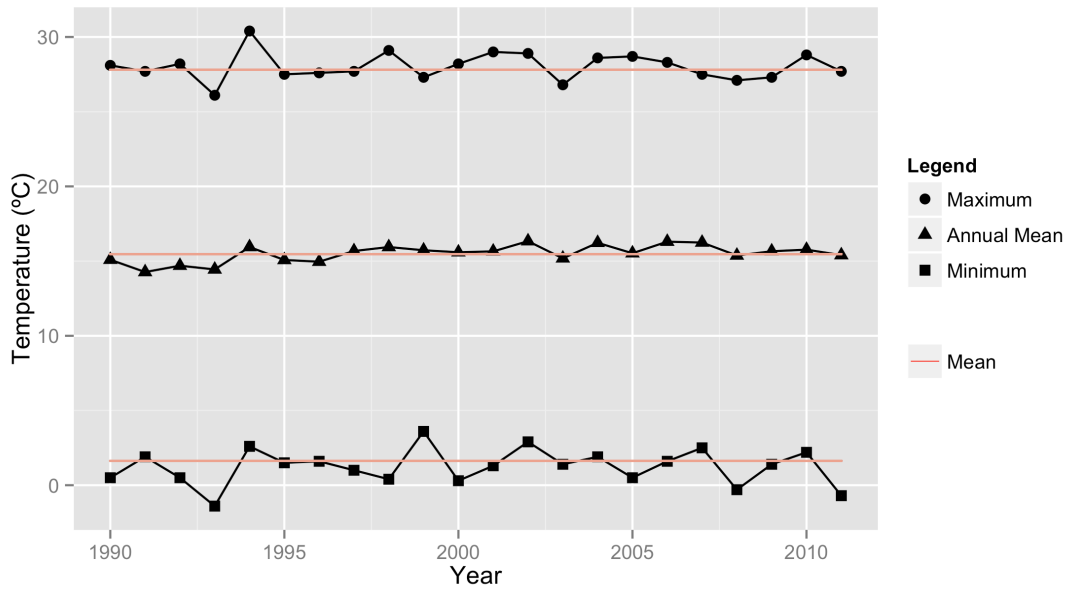
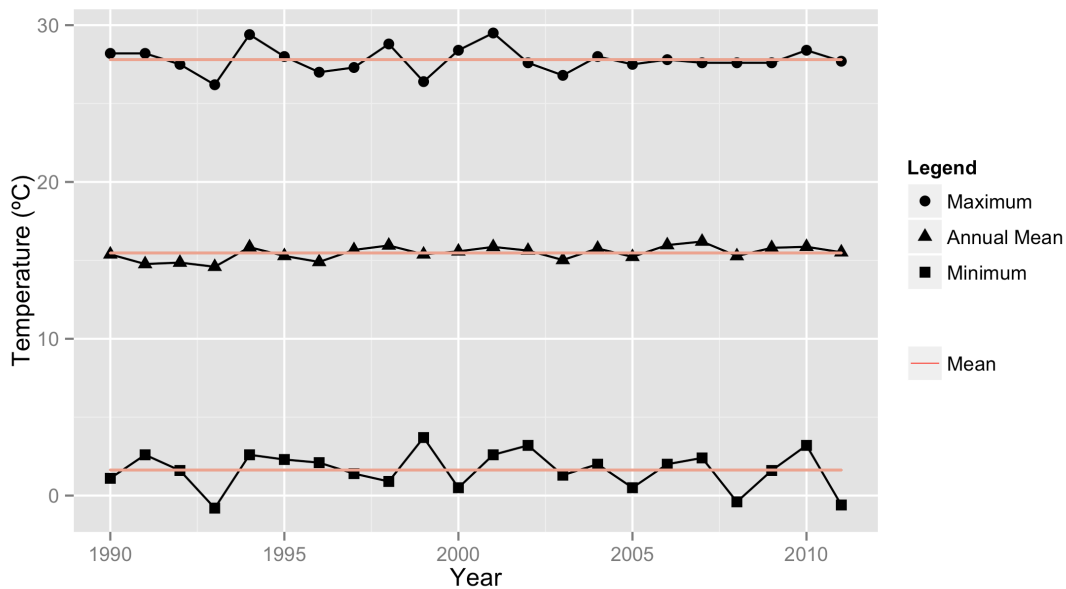


Figure 3-15: Annual T_{max} , mean and T_{min} temperature data (in degrees Celsius) from 1990 to 2011 for station 58215. Red line shows the mean for each data series.

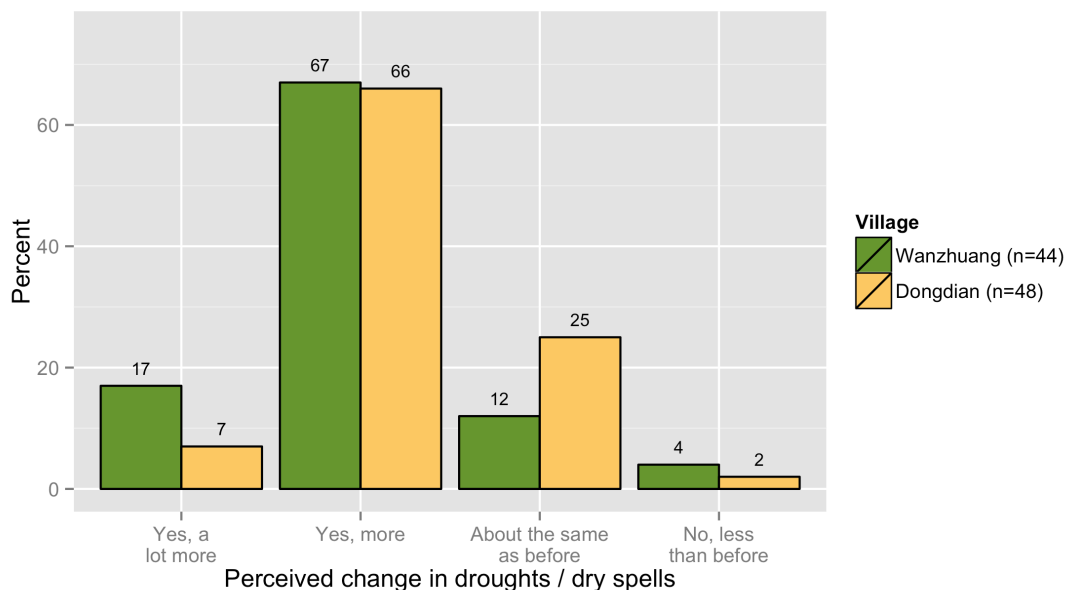


Two approaches were employed to investigate trends in the data. Firstly, a seasonal Mann Kendall test was employed on the monthly data series. The test statistics reveal a weak positive correlation between temperature and time over the length of the time series (Kendall's $\tau=0.192$, $S=525$, p (two-tailed) $=<0.001$ for station 58122 and

Kendall's $\tau=0.142$, $S=390$, p (two-tailed) $=<0.005$ for station 58215)³⁷. Overall, there appears to be no substantial changes in either the minimum, maximum, or mean annual temperature for stations 58122 and 58215.

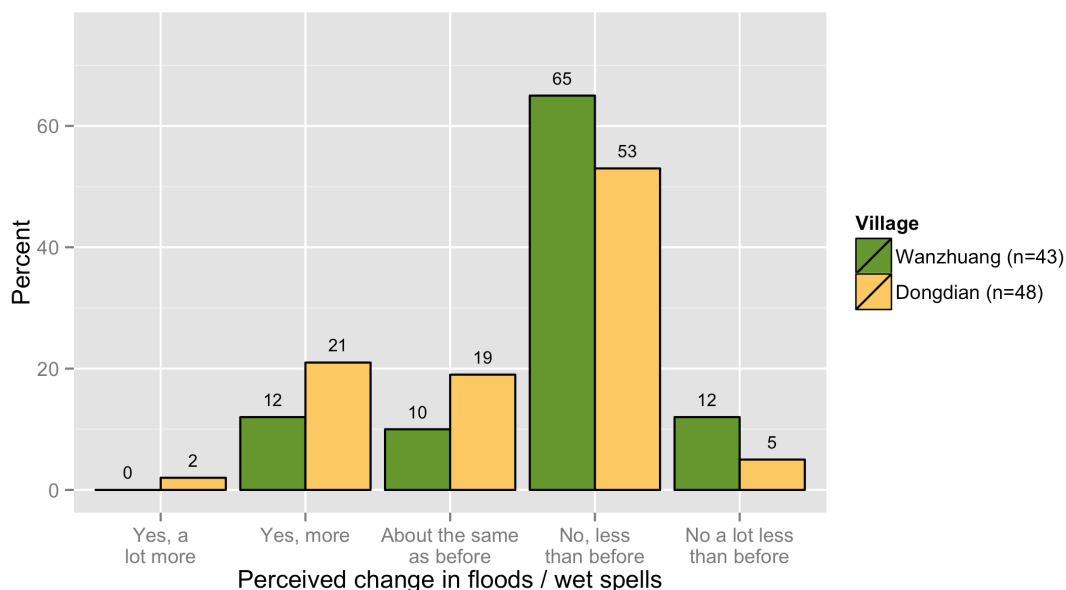
In addition to biophysical data, the household survey sought responses on the perception of changes in the weather. The analysis shows that overall respondents felt that the prevalence of droughts had increased whilst floods had decreased and this was fairly consistent between the two case study sites. Approximately 75 per cent of respondents in Dongdian and 84 per cent of respondents in Wanzhuang felt that there had been an increase in the prevalence of droughts and dry spells over the last 20 years (Figure 3-16). For flood and wet spell events the converse was true with a general perception that these were decreasing. In Wanzhuang, 77 per cent of respondents felt that there were a decreasing amount of floods and wet spells over the last 20 years, in Dongdian the figure was 58 per cent (Figure 3-17).

Figure 3-16: Perceived changes in the frequency of droughts over the last 20 years for respondents from both case study sites.



³⁷ The autocorrelation function revealed a temporal dependence in the deseasonalised data at annual intervals. Due to the annual lagged autocorrelation and additional Mann-Kendall Test was employed with a block bootstrap method. The test results for station 58122 (SE 0.041; CI at 95%: -0.060, 0.199) and station 58215 (SE 0.069; CI at 95%: -0.088, 0.193) suggest that the original findings from the seasonal Mann-Kendall test are not robust (the values of the relationship of the bootstrap population and the overall sample might be in different directions).

Figure 3-17: Perceived changes in the frequency of droughts over the last 20 years for respondents from both case study sites.



To summarise, both events under study, the flood in 2007 and the dry spell from 2010 onwards, exhibit characteristics of an extreme event. However, the events are well within normal bounds from a biophysical perspective. The impacts of the events and the responses to them are likely to be framed within prior lived experiences and existing norms of behaviour. In terms of future climate change, these events provide insight into existing coping and adaptation responses rather than novel behaviours engendered by extreme events beyond previous system limits. The review of China’s climate, extreme events and the impact on agriculture (see Appendix 6 for more details) show that the events such as these under study will continue to occur in addition to new more extreme events that are beyond current system limits and that they will impact on agriculture. This study, therefore, retains relevance by providing insight into coping and adaptation measures for events that will become more frequent under climate change rather than novel events that are more extreme.

3.4 Reflections and ethics

3.4.1 Limitations

I adopted a number of measures to maximise the credibility of my findings from the design through to the analysis (some of which have already been discussed in the section 3.2.3 above). The design of the research, as a multi strategy process, enabled me to triangulate between and within different research instruments and analytical strands. Furthermore, the phased approach of implementing the research instruments enabled me to use insights from one to inform the development and implementation on

another. The mixed methods approach also provided a deeper and more holistic understanding of the context within which the research was undertaken. Lastly, mixed methods research is particularly suitable for exploring complex phenomenon such as those under study in this research (Bryman, 2008: 629 - 652; Gray, 2014).

For each instrument the possibility of biases and distortions cannot be eradicated. Through the description of the research instrument I have been as open and honest as possible in setting down the approach adopted, the rationale for this and the key weaknesses of each method. This process reflects my wider desire to ensure that the claims I make in the subsequent chapters have substance and are believable.

Two further issues are worth re-emphasising at this point. The first relates to the events under study. At the outset of the research I sought to identify two different extreme events and their impact on rural communities in China. Based on my analysis of the literature, the middle and lower reaches of the Yangtze and HuaiHe River were suitable locations for the research as the region as a whole had experienced large and significant floods and droughts within the last six years. However, despite considerable effort and energy, it proved significantly harder to find suitable sites for research than anticipated. The eventual locations selected for the research were not ideal from a biophysical perspective in that the events under study were not exceptional.

Warner *et al* (2009: 205), reporting on a global project on migration and environmental change³⁸, highlight a number of issues related to adopting 'environmental change' as the independent variable. Of these the most salient relate to the difficulties (or impossibility) associated with isolating the variable of environmental change from other factors that impact on migration. In addition, they highlight the challenge of measuring any differences in migration without the presence of a true control group. The absence of a control group relates fundamentally to the operational constraints that arise from research in which an experimental design is not possible necessitating the use of other approaches such as a cross-sectional design (tends to have weaker internal validity). This is because it is not possible to isolate a control group in the conventional sense of the term and an inability to manipulate the independent variable (Bryman, 2008: 47). To mitigate these risks, the research design attempted to gauge how important the environment is in any decision to move (Bilsborrow, 2009), explored links in the timing of the move and impact of the flood or drought (Allison, 1984; Gray and Mueller, 2012), triangulated data with other sources (Jónsson, 2010) and surveyed both migrants and non-migrants (Bilsborrow *et al.*, 1984).

³⁸ The European Union co-sponsored Environmental Change and Forced Scenarios (EACH-FOR) project ran from 2007 to 2009 and was created to assess the impact of environmental change on migration at a local, national, regional and international level.

Warner and colleagues also highlight an important issue associated with *ex post* research design; namely the research has to be formulated in such a way that the participants can perceive the environmental change of interest. The events under study were visible to the participants but the visibility was not as great as I would have liked. Although the implications of this lower than hoped for visibility did not necessitate a change of method or instrument, it did require a recalibration of my analytical approach to one that relied less on statistical approaches to address the large amount of noise and comparatively weak signal. This issue also serves to illustrate a wider point (and more general finding) from the research: changes to the environment (even if very large) are, from a farmers' perspective, often surrounded by many other changes and signals that are just as important (if not more so) (see section 7.3.1).

Secondly, the case study sites were already significantly depopulated due to migration with two major associated impacts on the research. The first is that those who had left (particularly whole families) were not included in the research. This is an unavoidable omission set within the constraints that I was working and one that is not easily rectified. The second is that the remaining households are, at the time of the research exhibiting less mobility than those who have departed. The results and conclusions I draw in subsequent chapters should be considered with these omissions in mind. This is particularly important in terms of resilience; the changes evident in the case study sites represent existing adaptive behaviour to economic and social changes that have occurred in China over the last 20 to 30 years.

3.4.2 Ethics

I got ethical approval from the University's ethics board in August 2012. Two of the key ethical risks I identified during the ethical approval process were the difficulties of gaining informed consent and ensuring that vulnerable people were protected. The issue of gaining effective informed consent permeated the entirety of the primary research process from selecting communities for the research to identifying participants for interviews.

The original research design envisaged a process whereby community leaders and the local population would be briefed about the project and given the opportunity to participate in the research after they had been informed about its purpose and the likely consequences of participation. With regard to site selection, I got the impression, however, that once I had indicated to local officials the sites that were preferred, local communities were given only limited opportunities for consultation or options to refuse. Once active in the research sites, a similar process of gaining consent was repeated within the community itself. Village cadres provided information to the villagers about

the purpose of my visit and then requested their participation at the group events that I was running or for the household survey. Opportunities for discussion about the nature of the research and any risks that the participants may be exposing themselves to as a result of participating were limited or non-existent.

During the data collection, I ran a number of group exercises and had originally planned to seek informed consent (written or verbal) at the beginning of each activity. This was to help ensure that the participants were aware of the project and that they could refuse to participate if they wished. However, my Chinese collaborators felt that gaining informed consent in the way I outlined above was not a normal practice in fieldwork. The compromise was for the project outline and the informed consent process to be explained at the outset and verbal consent sought. Written consent would be requested at the end of each activity. Given the realities of language, I was reliant on my collaborators honouring this agreement in the field. This process fell short of my own aspirations for informed consent, but evidently went further than the usual practice adopted by my collaborators in their own fieldwork. These issues mirror the notion of consent 'cascades' described by Pamela Cox (2010) in her article on researching youth justice in Vietnam. In her article, Cox talks about consent from above opening doors further down the institutional hierarchy with the result that the consent of actual participants in the study was assumed rather than given.

I managed ethical considerations to the best of my ability in the field, although the need for snap decisions meant the choices that I was making would sometimes feel rushed and poorly considered. I was able to reflect on these issues through the extensive notes that I keep in my fieldwork journal, and I spoke at length with my supervisors via Skype and email. Through these processes of reflection and discussion, I was able to consider how I would behave if faced with the same or similar circumstances. This reflective analysis ensured I was better prepared for subsequent visits to the field. The issues that I experienced are neither unfamiliar nor uncommon, especially in former socialist states, and have been reported extensively (for Chinese case studies see, for example, Cornet, 2010; Gros, 2010; Heimer and Thøgersen, 2006; Michaud, 2010; Turner, 2010a). This process of reading and reflection away from the immediacy of the fieldwork provided me with the space to consider things more objectively and is something I recommend for other researchers (especially those who, like me, are new to the game).

Protecting vulnerable people and those in dependent relationships was another key ethical issue of which I was very aware during fieldwork. To administer my questionnaire survey, I used a team of eight enumerators (students from a local

university). To mitigate the risks for vulnerable people and those in dependent relationships during the survey work, I emphasised the importance of being alert for people who might be coerced into participating or responding. Furthermore, I highlighted that everyone undertaking any aspect of the research should be alert for vulnerable people (such as young adults or those with a mental disability for example) and make an assessment on a case-by-case basis as to whether they should and could participate in the research or not. The questionnaire survey was administered by a larger group of enumerators than I had intended. Using a larger number of enumerators reduced the amount of oversight and quality assurance possible during the conduct of the survey, leading to a greater reliance on the effectiveness of pre-survey training. For example, enumerators were trained to be upfront about the research and to clearly state that participation in the research was entirely voluntary.

I had originally intended to quality assure the interviews by sitting in on a sample of them. This was not practicable as my presence often made the interviewees feel uncomfortable. Furthermore, there was not enough time or capacity to assess survey enumeration in practice and to confirm that protocols set out during the enumerator training were being followed. After some consideration, I took the decision that I should not physically sit in on questionnaire surveys but request that enumerators record a sample of their interviews so that I could listen back to them once completed. The recordings were in Chinese, and it was not possible to listen to a translated version of them during the data collection phase itself. As such, these recordings only provided some sort of retrospective insight into the data-gathering process. I also sought feedback about the survey approach and the quality of the data generated from the enumerators and other members of the research team. These issues highlighted the reliance I had on my Chinese collaborators to guide me during the fieldwork and to provide assurances regarding quality and reliability of the data collection process.

The particular sets of issues described above revealed the complex and highly dependent relationships into which I entered with my research assistants and the wider Chinese research team. I was reliant on them to buy into the processes I wanted enacted in the field and communicate their importance to the enumerators. Such reliance often left me with a feeling of powerlessness as I could not directly communicate with the people that mattered and was forced to work through a third party who may or may not have adequately communicated my approach. Over the course of my fieldwork, and subsequently, I have come to appreciate the central role of research assistants in the data collection process and analysis. Research assistants mediate the researcher during research and are enormously influential. Research assistants decide what is considered important, how issues are communicated, and

determine to a significant extent how the research is portrayed to participants (Turner, 2010b). In short, the research assistant was central within my cross-cultural fieldwork and, I believe, significantly influenced the subjectivity of the data collected (Tebboth, 2014)³⁹.

In this chapter I have described my general research design and detailed the methods and analytical approach that I have used. I also provided an introduction to the research sites with specific reference to the climate context – a vital facet of the research before concluding with a discussion of the key limitations and reflected on the ethics of my research.

³⁹ Some parts of this section have appeared in the published article by Tebboth (2014), the content for the article arose from the experiences and insights I gained during my PhD research.

4 Major determinants that affect the endowment and entitlement to mobility

4.1 Introduction

This chapter explores the key determinants of mobility within the two case study sites using the conceptual framework presented in Chapter 2. Data are drawn from a variety of sources and provide insight at different levels of analysis. RRA activities provide community level insight into why people are and are not mobile and the reasons for this mobility or immobility. Interview data with migrants in Shanghai are used to explore the reasons why specific migrants chose to migrate to Shanghai (temporarily or permanently). Interviews with (temporarily returned) migrants and households in the case study sites generate understanding about mobility and immobility at a household level (which often includes multiple members of the same household). Analysis of survey data for the two case study sites provides detailed information about (im)mobility within households (over the last 10 years for longer-term moves and one year for shorter-term moves) and some explanatory information for this (im)mobility.

Drawing on the primary data highlighted above and augmented by secondary sources this chapter draws out some of the most notable features with regards to mobility across the case study sites. First, the analysis shows that mobility is socially differentiated at and within the household. Second, analysis of the decision-making process reveals it to be complex although strongly influenced by economic arguments. The rationales explaining shorter-term compared to longer-term moves are shown to be slightly different with an increased focus on local and more personal issues. Third, the analysis shows that a number of institutions are influential in facilitating or inhibiting mobility (for example state sponsored institutions such as the *Hukou* system and the gendered nature of intra household dynamics). Furthermore, these institutions have changed and will continue to change over time creating interesting dynamics that interact with each other creating feedbacks and synergies. The interplay of individual mobility decisions, structured within a multilevel institutional framework reinforces existing processes influencing mobility within the case study sites.

4.2 Understanding mobility

This section draws out the main characteristics of the more and less mobile populations within the case study sites. The analysis shows that mobility for and within those households that remain in the case study sites is high although a non-mobile minority is present. In the context of the research, across both case study sites, the more mobile population tends to be younger, male and, more literate than the less

mobile population. Poverty and ill health seem to place additional constraints on mobility, as does the number of dependents residing in the household. This analysis reveals considerable heterogeneity within the case study sites in regards to mobility and suggests that the processes through which social resources are mapped through to mobility entitlements are important in mediating who is or has potential to be mobile if desired.

4.2.1 Characterising socially differentiated groups through mobility

Mobility for and within households is high although a non-mobile minority is present

At an individual level mobility is high. Survey respondents reported that in 84 (n=97) households at least one member has been mobile at some point in their lifetime. The high prevalence of mobility by household members is also apparent for whole households. A social census undertaken in Wanzhuang indicated that 55 out of 104 households had left the village and returned only occasionally (normally for the Chinese New Year)⁴⁰ (see Figure 4-1). These data offer two analytical insights. First, that mobility of household members within the remaining households in the case study sites is very high. Second, that there has been a substantial number of whole households who have left the village over a longer timeframe.

Figure 4-1: Bricked up doorway of an empty house in Wanzhuang due to the out migration of the household to another location.



⁴⁰A similar number of households are also empty in Dongdian. This approximation is based on a visual survey undertaken by the researcher and not through a participatory social census. The data for the walk around survey are considered less robust and is therefore used only for illustrative purposes.

Whilst 84 out of 97 households have utilised mobility at some point in their lifetime, 13 households reported no mobility at any point during the lives of the household members. Individuals (n=25) within this group were compared to those individuals (n=190) in households that have employed mobility to identify any significant differences. The groups were compared at a household level (household size, total farm size and the asset index score) and at an individual level (*Hukou* registration, age, gender, health issues, literacy and years of schooling)⁴¹. Of these, only age (at an individual level) and household size (at the household level) were significantly different. The average age of those that reported never using migration (n=25) is older (mean of 61.68 years compared to 54.69 years) and statistically significant ($W = 2972.5$, $p = <0.05$, $r = -0.14$)⁴². The mean number of household members was smaller (2.17 compared to 3.20) and statistically significant with a medium effect size ($W = 695.5$, $p = <0.05$, $r = -0.25$) compared to the population from households where migration was more prominent⁴³.

Out of the 25 individuals that constituted the members of households in which nobody had ever migrated, the majority (21) described themselves as the head of the household or the wife of the household head. The remaining four were the first son or daughter of the household head or the wife of the first son or daughter of the household head. The age range for the offspring was from 20 to 33. Lastly, non-mobile households had a smaller farm size (4.60 mu) compared to more mobile households (6.30 mu). The most recent land distribution⁴⁴ (based on registered population in the village) was in 1990 for Dongdian and 1995 for Wanzhuang. The amount of land distributed is based on the number of registered household members and, in this instance, serves as a proxy for household size. At the time of the distribution, therefore, one can assume that the non-mobile population had smaller households than mobile households suggesting that the differences in household size have remained relatively static over the last 20 or 25 years.

Overall, these findings indicate that, for the majority of households in the case study sites, many individuals use mobility. This finding is not in itself unexpected considering

⁴¹ These variables were selected based on probable significance as indicated in previous studies of mobility (see, for example, the following studies Chan, 2012; Hare, 1999; Roberts *et al.*, 2004; Sun and Fan, 2010; Taylor *et al.*, 2003; Zhang, 2011).

⁴² Choice of non-parametric approach identified through visual inspections of histogram and qq plots showing non-normal distribution of responses for the sample population. The visual diagnosis was supported by Shapiro-Wilk test for normality (non-mobile population: $W = 0.8951$, p -value = <0.05 . (2dp); mobile population: $W = 0.9657$, p -value = <0.05 . (2dp). Wilcoxon rank-sum test used.

⁴³ Choice of non-parametric approach identified through visual inspections of histogram and qq plots showing non-normal distribution of responses for the sample population. The visual diagnosis was supported by Shapiro-Wilk test for normality (non-mobile population: $W = 0.783$, p -value = <0.05 . (2dp); mobile population: $W = 0.903$, p -value = <0.05 . (2dp). Wilcoxon rank-sum test used.

⁴⁴ Process whereby land in the village is reallocated to take into account changes in the population and economic development (Feng *et al.*, 2014).

the history of high levels of mobility from rural Anhui to other provinces (Chan, 2013; Liang and Ma, 2004). Despite this, a non-mobile minority is present across the case study sites; these households tend to be slightly older, have fewer members and slightly smaller farm sizes than the average. The statistically significant findings related to age (older) and household size (smaller) amongst the non-mobile minority could be linked especially when viewed in combination with the smaller farm sizes. One possible explanation could centre on a lack of children surviving to adulthood. If one assumes that the non-mobile minority either did not have children or did have children but they died before reaching adulthood then one would expect to find smaller household sizes on average. The smaller household size would impact on the amount of land that the household received during the last redistribution of land, resulting in a smaller farm size. Support for this line of reasoning is found in the data, with households from the non-mobile sample reporting no migration for current or previous household members thus precluding the presence of children absent through migration in the majority of cases.

Young move away and the elderly stay behind

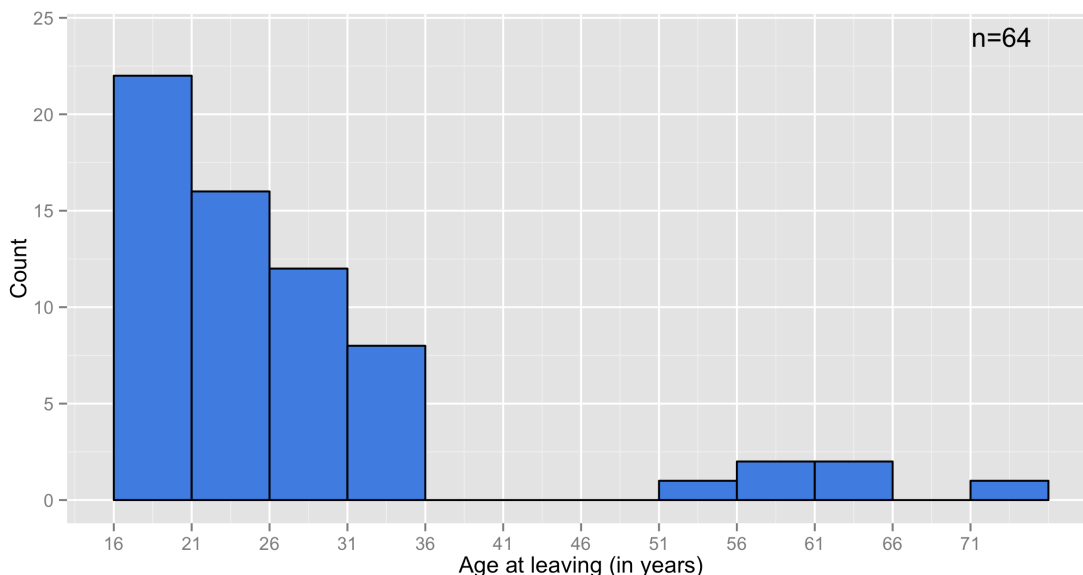
Analysis of survey data supports the findings of the previous studies that show that the young are more likely to be mobile than the elderly (Rozelle *et al.*, 1999a; de Brauw *et al.*, 2002; Feng & Heerink, 2008). The data on the population remaining in the case study sites differs from the age profiles of those who have left the case study sites on a longer-term basis. The mean age of the adult population that has left the village (based on proxy recall data) on a longer-term basis in the last 10 years (n=91 with 27 excluded as age unknown) is 27.1 years (1dp)⁴⁵. Figure 4-2 clearly shows the positively skewed distribution of the histogram indicating the vast majority of people who left the village in the last 10 years did so in their teenage years, twenties or thirties. Of those who have left only six were over the age of 36 years, the remainder, 58, were between 16 and 36 years old. The average age of the individuals who left the villages in the last 10 years was compared with the average age of those who did not. The Wilcoxon rank-sum test⁴⁶ shows there is a highly significant difference between the mean ages of the group employing longer-term migration (mean = 27.1 years) and the more immobile

⁴⁵ For a migratory movement to be included within the research it had to have occurred within the last 10 years for longer-term migration and one year for shorter-term migration from the date of the household survey (undertaken in June and July 2013). A longer-term migrant is defined as an adult (16 years or over) member of the household (defined as a usual resident of three months or more) who have left and not returned during the reference period. For those who have recently left, a minimum period away of three months or an intended period away of three months is used to discount short-term moves. A shorter-term migrant is defined as an adult (16 years or over) member of the household (usual resident of three months or more) who has been away for more than one week but less than three months at any point in the last year.

⁴⁶ Choice of non-parametric approach identified through visual inspections of histogram and qq plots showing non-normal distribution of responses for the sample population. The visual diagnosis was supported by Shapiro-Wilk test for normality (non-mobile population: $W = 0.9541$, $p\text{-value} = <0.05$. (2dp); mobile population: $W = 0.72$, $p\text{-value} = <0.05$. (2dp).

group (mean = 56.2 years) with a large effect size ($W = 1039.5$, $p = <0.001$, $r = -0.61$ (2dp)). The age profile of shorter-term migrants ($n=30$, 1 excluded as age unknown) is more closely aligned to the immobile population, although slightly younger, with an average age of 46.5 years. A Wilcoxon rank-sum test⁴⁷ showed the difference between the age profile of the households containing shorter-term migrant members (mean = 46.5 years) and the immobile households (mean = 56.2 years) to be statistically significant ($W = 1798$, $p = <0.05$) with a small effect size ($r = -0.19$ (2dp)). An additional group of 19 households reported that household members had migrated at some point but it was outside of the reference period for the research and not included as a separate category of mobility within the analysis.

Figure 4-2: Age of adult household members (at time of departure) for both sites who left the household and have not returned during the reference period.



The finding that the average age of the remaining inhabitants of the village is considerably older than those who have left is supported through interview data. Wang Meiyang, a female working in a clerical position, typifies the view of many of the migrants interviewed

Because there wasn't much industry, no factories or whatever there, many people started to migrate to work. They used to cultivate some vegetables at home, but the incomes were too poor and the costs were dearly, most of them left to make money and came back to spend it. ... Most of the time there are only

⁴⁷ Choice of non-parametric approach identified through visual inspections of histogram and qq plots showing non-normal distribution of responses for the sample population. The visual diagnosis was supported by Shapiro-Wilk test for normality (non-mobile population: $W = 0.9541$, $p\text{-value} = <0.05$. (2dp); mobile population: $W = 0.8781$, $p\text{-value} = <0.05$. (2dp).

old people or young kids left at home, and we return back less often, since we have to work (20130715 Interview Wang Meiyong).

The quote clearly illustrates that the interviewee believes that the majority of young people have left the village and that the reasons for leaving are strongly associated with poor incomes locally and opportunities elsewhere.

Analysis of migrant interview data reveals that not only do the migrants see rural to urban migration as something that young people do but also that the village is a place for 'elders'. This dichotomy was a feature of a number of interviews both in the case study sites and in Shanghai. For example, two migrants quite clearly identified the village as a place for old people and retirement, whilst the city was a place for adventure. Wang Meiyong, when asked about plans for the future, said,

Wang Meiyong: We [Wang Meiyong and boyfriend] think we would stay here [Shanghai] when we are young, and go back when we are getting old.

Research Assistant (RA): Oh, you will go back after giving birth to a baby, or?

Wang Meiyong: No, when we are old.

RA: After retirement?

Wang Meiyong: Right (20130715 Interview Wang Meiyong).

Similarly, when asked to compare Shanghai to his home village Wang Dao stated that:

For instance in my hometown, the elders would pass their late life there, ... [taking a] stroll ... and some of fishing then, raising some chicks and ducks. That is [a] rather comfortable life. But Shanghai is a place for work, ambitions, and targets, isn't it? ... for us young people, it would be shame not to go out for an adventure, and just stay at home (20130713 Interview Wang Dao).

These quotes show the village is thought of as a place for elders, with a slower and more comfortable pace of life where as the cities are dynamic, full of potential, and places for the younger generation.

Gendered patterns of migration

The gendered difference between migrants who left on a shorter-term basis compared to a longer-term basis is stark. For shorter-term migration (n=30), 53 per cent of people were male and 47 per cent were female. For longer-duration migration (n=91), 65 per cent were male and only 35 per cent were female. The higher proportion of males

involved in longer-term migration is not reflected in the more equal overall gender balance of the case study sites, which is approximately one-to-one (104 males to 111 females). The difference in the gender balance between the two different types of migration is interesting and perhaps revealing of the different expectations and demands placed on those who migrate in addition to their own aspirations.

Shorter-term migrants are predominantly the household head or the wife or husband of the household head whereas longer-term migrants tend to be the children of the household head. Shorter-term migrants, in addition to their work outside of the village, also need to maintain the household, farm and carry out a number of other duties to participate in village life. The practice of shorter-term migration needs to be flexible enough to accommodate the competing demands on an individual's time and thus may be more opportunistic and accessible (with varying durations and frequencies). In contrast, in Chinese society, sons are more likely to and are expected to migrate for work and hence earn money that can be remitted whereas daughters are more likely to migrate for marriage with the migration of a more local nature. These practices are associated with the patrilineal and patrilocal institutions prevalent in rural China and perhaps explain the more gendered nature of the longer-term migration (Cong and Silverstein, 2011).

The gendered nature of rural society in China (and beyond) is widely discussed in academic literature and recognised as a central aspect within household organisation and migration decisions (see, for example, Barbieri and Carr, 2005; Chant, 1992; Fan, 2004; Guo *et al.*, 2009; Guo *et al.*, 2011; Hunter and David, 2011; Locke *et al.*, 2013; Lutz, 2010). The roles within households and the expectation of those who migrate are strongly structured by gender roles (Whyte, 2004). For example, intergenerational transfers are considered manifestations of the Chinese tradition of filial piety (a Confucian value). In a similar vein, Xu (2001) has argued that sons are normally preferred to daughters in rural China owing to the perceived advantages they bring in terms of economic (remittances and support in old age) and social (maintaining the family line) functions and family roles (labour on the family farm for example). Chant (1998: 5) states that feminist writings have incorporated a 'greater acknowledgement of "the household" as a geographically and historically dynamic social institution in which gender is embedded and negotiated'. In highlighting the role of the household, scholars have demonstrated the importance of intra-household dynamics in contributing to the gender selectivity of population movement. The findings from this research offer some support for this thesis for longer-term migration but less so for migration of shorter duration where a significant proportion of time is spent within the village.

Migrants tend to be better educated

Distinguishing between the two forms of migration (longer- and shorter-term) a clear difference is evident in the levels of literacy. Population members of the longer-term form of migration have a literacy rate of 87 per cent (n=91). This high level of literacy contrasts sharply with the literacy rate of the population practicing shorter-duration migration (n=30, 1 excluded as literacy status was uncertain). In this group, there is an approximately even split between those who are literate (52 per cent) and illiterate (48 per cent). This difference is also evident when comparing the two literate sub-groups. The literate shorter-duration sub-group attended school for a mean average of 6.4 years (1dp; n=15) whilst the longer-duration sub-group attended on average for three quarters of a year more (mean of 7.4, 1dp; n=73).

The difference in literacy rates and years at school between the two sub-groups is not in itself surprising owing to the significant difference in ages. The longer-duration sub-group are a lot younger and therefore have benefitted from the substantial improvements in access to education, certainly up to primary school level, that have been witnessed in China over the past 30 – 40 years. The shorter-duration sub-group are a lot older and have not benefitted from the more recent changes to education provision. Chan (2013) argues that increasing education provision and access in poorer provinces facilitates longer distance migration by making it more feasible for those individuals with higher educational achievement. Increased levels of education are likely to increase the propensity to migrate by opening up more opportunities in the employment sector and increasing earning potential. In addition, educational attainment may also broaden horizons and ambitions.

4.2.2 Barriers to mobility

Poor health

Of the 212 adults captured through the household survey, approximately two fifths were identified as having some sort of health issues that were considered 'serious'. The majority of issues reported were of the chronic nature (33 per cent) or some sort of physical illness (6 per cent). Ill health has a number of impacts on a household, including increased expenditure on medicines, reduced ability to work and earn income, and increased reliance on other household members. For example Wang Zhou and his wife worked in Shanghai until 2013 but had to return home to their village as their father suffered from poor health. Wang Zhou's father had to pay 50,000 RMB for treatment, which he funded by borrowing 40,000 RMB from his sister whilst the Government paid the remainder.

The nutritious drugs in the hospital could not be reimbursed, several boxes of the albumin for enriching the blood, valuing thousands yuan [RMB], could not be reimbursed. ... in the operation, analgesia was necessary. Only one analgesic rod costs one thousand yuan, equivalent to a lot of money along with albumin for blood, nearly less than 10 thousand yuan. All these things could not be reimbursed (20140203 Interview Wang Zhou).

Wang Zhou thinks that the loan will take about one to two years to repay depending on the income from agriculture. Wang Zhou also commented that if the *Hukou* of the father is in Lixin (the location of the hospital) then the Government will pay more (80 per cent) but this is not so, therefore the Government will pay only 20 per cent. Since moving back to the village, Wang Zhou has taken up farming but their economic situation is worse compared to when they were working in Shanghai. In another interview, Pan Yao reported that he had to stop farming due to high blood pressure and a heart complaint. These conditions require ongoing medication to control as well as visits to hospital when the situation periodically deteriorates. Although the costs of the some of this care are met through the 'New Rural Cooperative Medical Scheme'⁴⁸, the double impact of reduced ability to earn a livelihood and increased costs of treatment have impacted on Pan Yao's life (20140206 Interview Pan Yao).

These two cases highlight the impact that poor health can have on individuals and families. The double impact of increased costs and reduced ability to earn a living are compounded by poor health insurance schemes. The insurance schemes frequently do not meet the cost of ongoing care or major interventions (such as operations). In addition, the payment structure of the schemes are linked to the location of one's *Hukou* registration and the location of the medical provision. These stipulations disadvantage those individuals living in rural areas, as the quality and coverage of health care is substantially reduced compared to large urban areas. Access to health care and support for the costs of health care are inextricably tied to the location of one's *Hukou*. For people like Wang Zhou and Pan Yao this means that their ability to migrate if they wish is limited, as institutions associated with *Hukou* system place constraints on the location of people and their home. A similar conclusion was reached by Giles and Mu (2007) in relation to the ability of adult children to work away from their parents during periods of illness. They found that the ill health of elderly parents reduces the probability of adult children participating in the migrant labour market. The

⁴⁸ The national scheme is a voluntary risk-pooling programme that provides partial reimbursement for health care costs associated with major illnesses. Households purchase medical insurance for an average of 10 to 20 RMB per person per year. Although a national scheme, it is operated at a county level with the County Government defining the type, nature and degree of coverage. Generally, all policies cover a proportion of inpatient expenses but the level and type of cover for outpatient expenses is considerably more varied (Babiarz *et al.*, 2010; Brown *et al.*, 2009).

reasons for this reduced participation in the labour market were associated with the lack of a social safety net and the continuing expectation for children to care for their parents.

Poverty

A number of the issues described above are also relevant when examining the impact of poverty on migration. In rural China, those households and individuals that are considered to be living in poverty are classified as either *Wu Bao Hu* or *Di Bao Hu*. *Wu Bao* or the 'Five guarantees' provides support for the elderly, disabled and those under 16 years of age who have no ability to work, earn a livelihood or family to look after them. The policy aims to provide a minimum standard of living for the target group and achieves this through the provision of services in five core areas. The five areas or guarantees are: food and fuels; clothing and other daily necessities; medical care, housing and burial services. The support provided is basic and depends on the finances available in the locality. *Di Bao* or the Minimum Livelihood Guarantee Scheme provides a social safety net for the extremely poor. The scheme is designed to provide a minimum standard of living for all households whose income is below an agreed standard (the *Di Bao* line). In 2010, the average *Di Bao* line was 1316 RMB per person per year (Ahmad, 2007; Zhu, 2014). Once recognised as either *Wu Bao* or *Di Bao*, individuals receive some income support from the Government. As with the social welfare provision for health, *Wu Bao* or *Di Bao* is tied to one's *Hukou* registration. Owing to the difficulties of moving one's *Hukou* to another location this way of structuring benefits effectively ties recipients to a location if they wish to receive the benefits.

Wang Hong-Li is aged 82 and was born in the village and has no formal education. He is illiterate and very poor. Wang Hong-Li lives with his wife in the village, they have one daughter who lives 9 km away. Wang Hong-Li's *Hukou* is local and agricultural. Wang Hong-Li is *Wu bao* and his wife is *Di bao*. WZL has 2 mu of land in which he farms vegetables: mainly wheat (winter season) and bean (summer season) for personal consumption. In describing any constraints on his mobility, Wang Hong-Li reported that it is not allowed by Government for him to move from one administrative village to another village. Even if the local administration allows him to move, the destination (or host) administration forbids it. Furthermore, Wang Hong-Li's *Wu bao* prevents migration: he can't carry it with him if he moves (20140203 Interview Wang Hong-Li).

Another example of this type of institutional constraint is provided in the life story of Wang Dewei. He is 86 years old and married; his wife is 83. Wang Dewei was born in this village and spent his life farming although now he is unable to do much and only

farms a very small plot for personal consumption. Wang Dewei has no education or formal schooling and is illiterate. Both Wang Dewei and his wife are *Di Bao* and receive aid from the Government. Wang Dewei can't remember the exact amount but thinks it is about 1,000 RMB per year per person. Wang Dewei reports that this is not enough for them to live on. Their daughters give gifts and money to help them to live, which brings their standard of living up to a basic level. Wang Dewei and his wife have no intention of leaving the village: his financial status is poor so they have never had the choice to consider (20140204 Interview Wang Dewei).

The experiences of Wang Hong-Li and Wang Dewei demonstrate the minimum standard of living that the *Wu bao* and *Di bao* social support provide and reveal some of the costs of relying on this type of income support. In these two examples, the households of Wang Hong-Li and Wang Dewei have few physical assets, their asset index scores were very low and they occupied two out of the bottom three positions when ranking all of the households surveyed, those assets that they do possess are of poor quality or in a poor state of repair (for example the houses were in very bad condition). Additionally, they have very limited amounts of financial capital and were widely acknowledged as being amongst the poorest in the village. The social support networks were very constrained with no large extended family and those family members that were around were also described as poor. Their ability to work and earn a living was also severely curtailed. In short, they were almost entirely reliant on the state to maintain their current standard of living. As a result, even if they had the means to move their ability is constrained as the state currently forbids the transfer of social welfare schemes such as *Wu bao* or *Di bao* to other locations. The schemes themselves are linked to the recipients' *Hukou*, which is almost impossible to change if one is very poor. The experiences outlined above highlight the importance that the close links between wealth and the *Hukou* system. The *Hukou* system has much greater importance if one is poor compared to more wealthy individuals and families, where your *Hukou* registration is considerably less important.

Dependents

In the case study sites, 51 households contained dependents⁴⁹ of which one had no members traditionally considered to be economically productive (n=96 with one excluded as data was incomplete) (see Table 4-1 below). The mean ratio was 0.56

⁴⁹ Commonly defined as all people over the age of 64 and under the age of 15 (China Statistical Press, 2012: 3 Explanatory notes for major statistical indicators). However, owing to the large numbers of individuals who are over the age of 65 and still economically active, I included an additional criteria that takes into account the relationship between adults within the household to identify those who are less likely to be economically productive. For people to be considered as dependent they must be under the age of 16 or over the age of 64 and also an elderly relative of the household head.

indicating that for every one non-economically active household member there were approximately two active ones.

Table 4-1: Percentage of households with dependent members (see footnote below for the definition of a dependent).

Dependency ratio	Percentage
0	47
0.33	4
0.50	14
0.66	4
1.00	20
> 1	11

Previous studies have indicated that those with dependents are less likely to be mobile than those with no dependents (De Brauw *et al.*, 2002; Feng and Heerink, 2008; Rozelle *et al.*, 1999). In a study in Henan province, Yan *et al* (2014) found that participation in migration was significantly affected by the number of dependents living in the household. The number of dependents in a household can have a significant impact on the household in a number of areas. First, additional people to feed and clothe can increase the demands on household budget. Second, in caring for elderly and infirm dependents, the possibility of costs associated with medical treatment for example is also very real. Third, the ability of other members of the household to earn a living may be reduced as more time is spent looking after dependents. Forth, the existing physical assets of the household may also be inadequate (such as space requirements for sleeping or studying).

The issues described above are brought into stark relief in the experiences of Pan Lijuan's family. Pan Lijuan cares for four grandchildren and an 80-year old uncle on her husband's side. On a normal day, Pan Lijuan gets up very early before sunrise to light up for the cooking for the grandchildren in order to get them to school by eight o'clock. Whilst the grandchildren are at school, Pan Lijuan cares for her uncle. In the early afternoon, Pan Lijuan returns to school to pick her grandchildren up and gives them lunch before returning them to school again. At five o'clock in the evening she will pick her grandchildren again and make dinner. Also in the afternoon she needs to wash the children's clothes. Pan Lijuan reported that financially it is very tough despite the remittances she receives from her daughter and son to look after the grandchildren. Caring for their uncle does have an impact on the life of Pan Lijuan and her husband, both in financial terms and day-to-day activities. Their uncle has health problems and needs to go to hospital and take medicines regularly. Pan Lijuan and her husband do

not calculate the cost but they do pay for the medicine. The family does have health insurance but it does not cover chronic complaints (20140205 Interview Pan Lijuan).

This story of Pan Lijuan clearly highlights some of the issues associated with dependents living in the household. High demands are placed on carer's time, money and other resources often with little recompense. The primary carers will be responsible for the dependents and this is likely to restrict their mobility. Firstly, Pan Lijuan cares for four grandchildren with two of the four attending a local school. The grandchildren in her care require the household (its location, registration and members) to access schooling, which may not be possible in urban areas. At the other end of the age spectrum, Pan Lijuan cares for an uncle on her husband's side who has no other family and suffers from health issues. Pan Lijuan plays an indispensable role in supporting her wider family of which a key aspect centres around the retention of a presence and residence within the village.

4.2.3 Social structuring of mobility

Mobility is structured by a range of factors that are apparent at different levels of analysis. At an individual level, life stage is very important, with younger members of the case study sites much more likely to be mobile. Gender is also an important factor along with age: older, female members of the case study sites are much less mobile compare to younger males for example. Within the case study sites some key characteristics are apparent that often differentiate mobility and mobility potential from the more immobile. The more mobile individuals tend to be male and also better educated (although the improving standards of education in rural areas also contributes significantly). Similarly, ill-health and poverty adversely affect mobility. Additionally, households with dependents, specifically the primary carers within the households are also less likely to be mobile or have the potential to be mobile. These characteristics paint a picture of who is and is not mobile: they tell us who is more likely to leave the village and seek other livelihoods elsewhere, who may elect to split their livelihood between multiple destinations and who is likely to remain in situ mirroring much existing social analysis of migrant selectivity (Connelly *et al.*, 2010; Fan, 2002; Roberts *et al.*, 2004; Sun and Fan, 2010; Zhu, 2003).

Relating the analysis and cases described above to the theoretical framework presented in Section 2.4 provides some additional insight. Institutional factors at a household level influence expectations within a household. Younger (male) members are expected to migrate, compelled even, raising questions about the degree to which a decision to work outside of the village is always as voluntary as it is often portrayed. Those remaining in the village are often expected to fulfil a number of functions to

support the wellbeing and functioning of the extended family. Caring for grandchildren and looking after elderly relatives are not provided 'for free' but carried out in order to achieve other goals such as increasing the legitimacy of claims over the benefits of migration. The role of the state is also shown to be very important in limiting the ability of people to map their mobility endowments into mobility entitlements through the structuring of social welfare schemes for example, highlighting the importance of certain institutions. The role of institutions is an issue I return to later in this chapter, but before I do, I address the perceived causes of migration from the perspective of the village inhabitants.

4.3 Key determinants of mobility

In this section I will show that there are many factors that influence mobility. This view of mobility, as a complex phenomenon, driven by multiple processes, is in line with more recent developments and conceptualisations of mobility (see, for example, Black *et al.*, 2011a; Kniveton *et al.*, 2008; Laczko and Aghazarm, 2009; McLeman and Smit, 2006; Renaud *et al.*, 2011). Secondly, I argue that the different types of mobility evident in the case study sites are perceived to result from slightly different sets of reasons. Comparing the reasons given for specific instances of migration with the reasons provided concerning the reasons why people migrate more generally some notable differences emerge particularly around the importance of *Hukou* and maintaining a claim on family land.

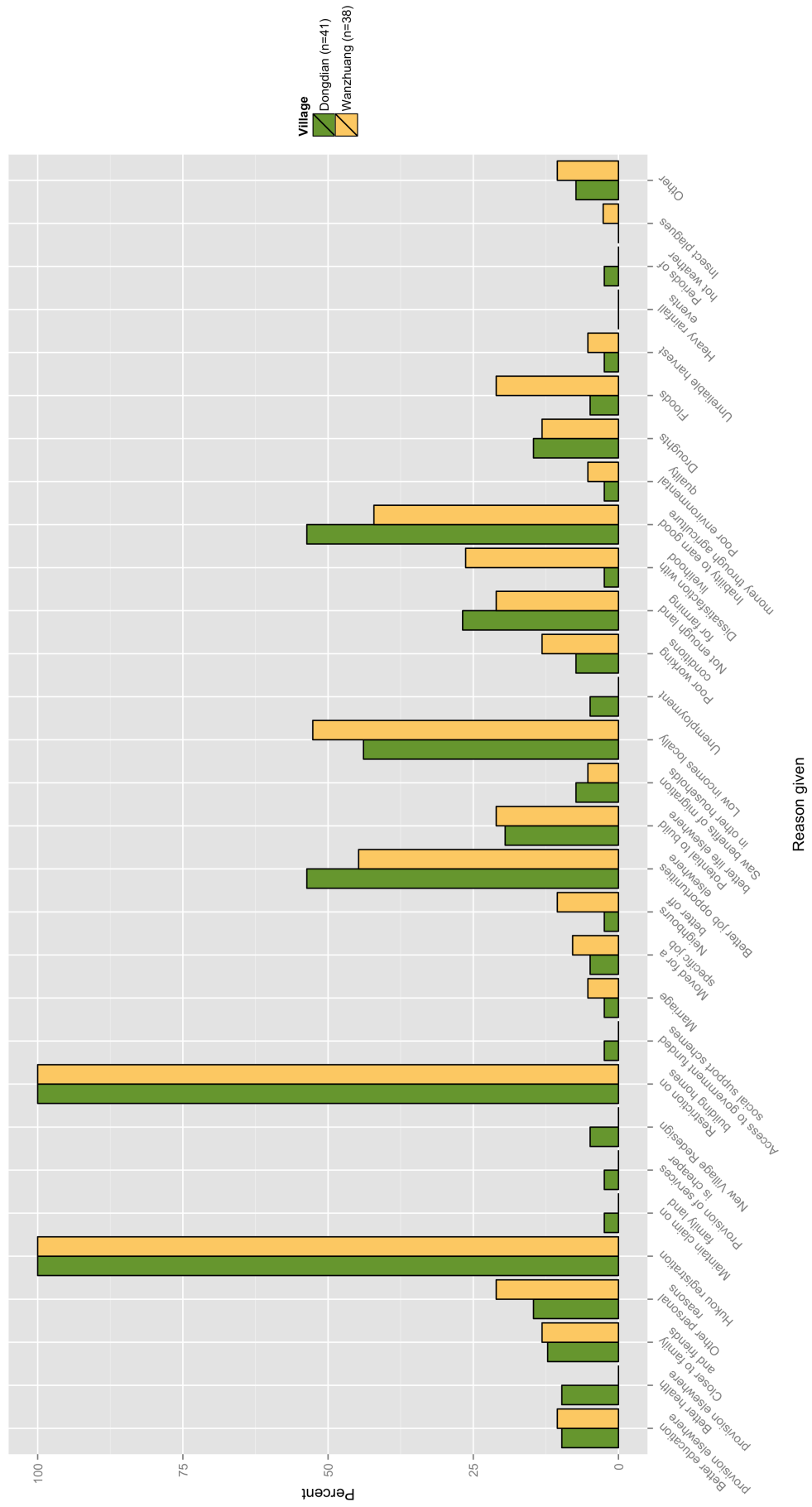
4.3.1 Mobility decisions are complex and driven by a number of factors

In the questionnaire survey, respondents highlighted a number of reasons influencing decisions to migrate (includes shorter-term, more circular migration and longer-term migration) for members within their household. On average, respondents in Dongdian selected 5.2 reasons compared to 5.5 reasons selected in Wanzhuang. Focusing on the specifics of the reasons selected for migrating, some of these can be seen as more pertinent to the origin location whilst others relate to conditions or the perceived conditions at possible destination locations (see Figure 4-3 below). Comparing the sites one can see that there is not a great deal of variation between them. The two most common responses (selected by all respondents excluding incomplete cases) was '*Hukou* registration' and 'Restriction on building homes [locally]'. Both of the two most commonly selected issues are related to the local and national policy environment or formal institutions.

The next most commonly cited reasons influencing migration decisions can be seen as more structural and macro economic. Respondents from both sites indicated that an

'inability to earn good money through agriculture', 'low incomes locally' and 'better job opportunities / ability to earn more money elsewhere' were important in influencing mobility decisions. All of these reasons relate strongly to the way in which China's economy operates and, more broadly, the social and political context that has given rise to this particular economic model. The role of agriculture and the uneven economic development that has been witnessed since the beginning of the reform era have contributed to the huge differentials between living standards in urban and rural China (see Appendix 4). As a result of these structural imbalances, there has been a prolonged labour surplus in rural areas and high demand for low skilled jobs in urban areas as well as large differences in earning potential (Jun *et al.*, 2009; Yao, 2010).

Figure 4-3: Factors considered important in influencing household migration decisions. Responses only sought from household that indicated at least one member had migrated at some point in their lifetime. In most cases answers provided the household head (multiple responses possible).



The impact of income differentials between sending and receiving locations and conditions of the local labour markets is a key influence on (labour) migration. A recent study by Xie and Zhou (2014) highlights the continuing disparity within Anhui between rural and urban areas and between Anhui and other provinces (such as the more urbanised Eastern seaboard that includes Shanghai and Tianjin). For example, the income differential between rural Anhui and urban Shanghai, Beijing, Jiangsu and Zhejiang is stark (see the Table 4-2 below). Such differences are considered very important in influencing the volume and location of migrants in China (see, for example, studies by Bao *et al.*, 2009; Chan, 2012; Hare, 1999; Zhu, 2002; Zhu, 2003).

Table 4-2: Income differences (adapted from Xie and Zhou, 2014 Supplementary Table 01).

Area	Difference
Anhui (rural)	0.18
Beijing (urban)	1.00
Shanghai (urban)	1.10
Jiangsu (urban)	0.79
Zhejiang (urban)	0.94

Entries represent ratios relative to urban families in Beijing, so urban Beijing is set to 1. In 2010, the average household income per capita in urban Beijing was 29,073 RMB. Income differences are based on province-specific, rural/urban-specific average household income per capita

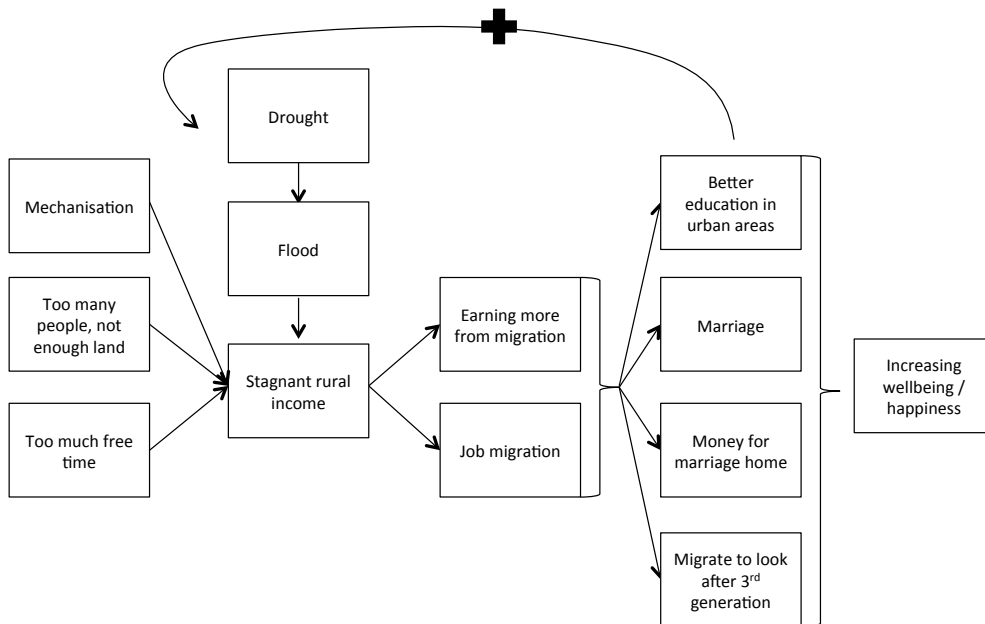
Linked to farming specifically, between a fifth and a quarter of respondents across the two sites (Dongdian (26 per cent); Wanzhuang (21 per cent)) highlighted a lack of land for farming as a consideration in mobility decisions. A key mechanism through which farmers can increase their incomes is by increasing the size of their land holding and the amount of crops they are able to farm. However, owing to the land tenure arrangements in rural China, this option is constrained for most farmers (certainly if they wish to substantially increase farm size), limiting one key avenue through which incomes can be boosted. This result appears to support the conclusions of Yan *et al* (2014) and Zhang and Donaldson (2012) who assert that the current land tenure arrangements in rural areas of China certainly do not inhibit mobility. Evidence from the questionnaire survey indicates that current land tenure arrangements may actually act to push people out of rural locations.

The last issue to highlight from Figure 4-3 (above) is the perceived role of the environment as a factor influencing migration decisions. Seven different types of environmental drivers were included as potential options for respondents to select from: 'Poor environmental quality', 'Droughts', 'Floods', 'Unreliable harvest', 'Heavy rainfall events', 'Periods of hot weather' and 'Insect plagues'. 21 per cent of respondents stated that floods were an issue that influenced migration decisions in Wanzhuang,

compared to 5 per cent in Dongdian. Approximately equal proportions of respondents indicated that droughts were an issue (15 per cent in Dongdian and 13 per cent in Wanzhuang) suggesting both sites suffer from this type of environmental perturbation. All of the remaining issues were selected by 5 per cent or less of the respondents. In terms of ranking, droughts were the eighth (sixteenth) and floods were the sixteenth (seventh) most commonly selected reason for Dongdian (Wanzhuang). Two main issues are revealed in this analysis. First, the greater prevalence and risk of flooding in Wanzhuang compared to Dongdian is reflected in the comparatively higher number of participants that identified it as a factor influencing migration decisions in Wanzhuang. Second, the overall perception of the role of environmental issues as a factor influencing migration decisions appears to be weak.

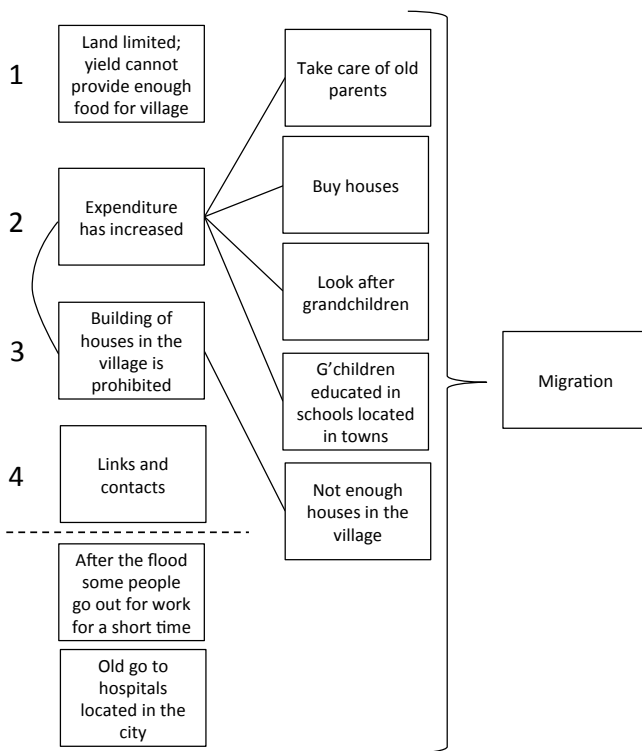
The rural appraisal activities support the findings discussed above. Figure 4-4 and Figure 4-5 (below) show the output of an exercise designed to elicit the key issues that cause mobility in the two case study sites. The exercise was implemented in two parts. In the first part of the exercise a group of key informants self-identified issues they considered key in influencing migration out of the case study site. Using cards the respondents then identified groups or links between the different issues to reveal some of the underlying processes responsible for migration. Some differences between the two sites were in evidence but overall a similar set of processes was identified.

Figure 4-4: Output of a rural appraisal activity to elicit key causes of migration and links between them for Dongdian Village (activity 20130417 RRA6DD, six male participants all of whom are farmers)*.



*Lines show links between issues as perceived by participants; plus sign indicates a positive feedback mechanism.

Figure 4-5: Output of a rural appraisal activity to elicit some key causes of migration and links between them for Wanzhuang Village (Activity 20130503 RRA6WZ, seven men, six of whom are farmers and one was a local village cadre)*.



*Lines show links between issues as perceived by participants.

For Dongdian, the constraints of land and rural income were identified as factors contributing to people leaving the local area whilst an ability to earn more through mobility was highlighted as the reason why people predominantly selected urban areas. Floods and droughts were included as an influence of migration decisions but can be construed as a secondary issue contributing to stagnating incomes. Mechanisation had a dual meaning for the participants. The first meaning related to the adoption of technology that freed up labour from the land and reduced reliance on oxen to plough for example. The second meaning related to the inability to mechanise further and was strongly associated with the small parcels of land that inhabitants farmed reducing their ability to scale up production. The dominant message underpinning the story of migration in Dongdian was a positive process that increased the wellbeing of individuals and families.

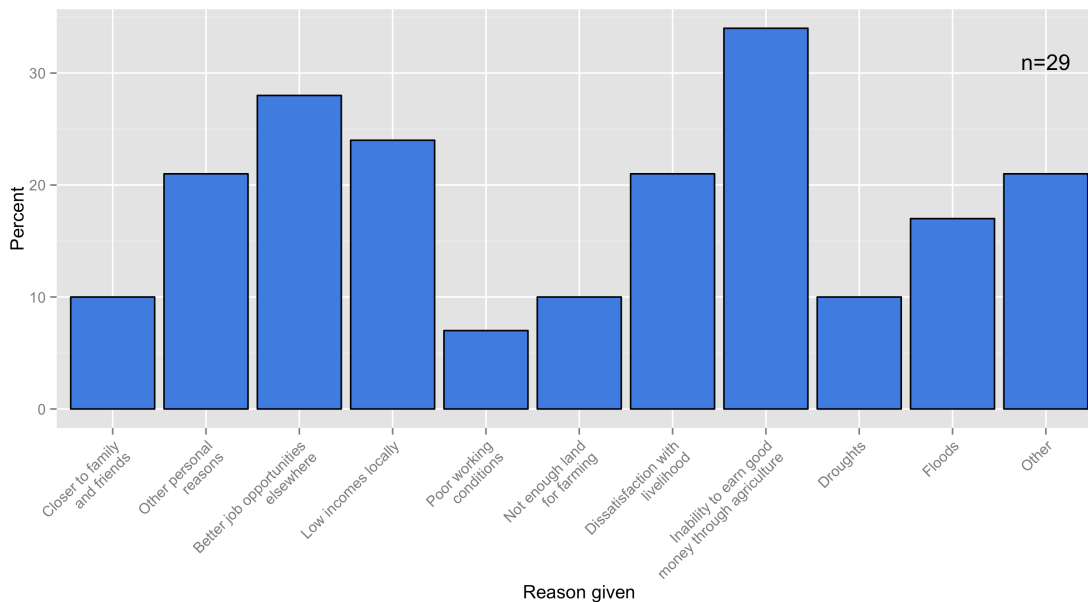
In Wanzhuang a similar set of issues was highlighted although framed around the necessity of migration and some of the issues this generates in the village. The increasing expenditure (see #2) is strongly related to migration and can be seen as a corollary of stagnant rural incomes in Dongdian. As a result of the job-related mobility of family members, a new group of issues were highlighted that impact upon remaining rural household members and future generations. For example, care for elders were reported as becoming more monetized owing to the physical absence of children. Additionally, grandchildren were often returned to the village and placed in the care of grandparents who became their *de facto* parents, the parents of these children would often remit money for their care. Housing is an interesting issue. The informants reported that there was a desire to use the financial assets generated through job-related mobility to invest in capital assets such as housing. However, the building and renovation constraints placed on the case study sites through the proposed New Village Redesign project (discussed in detail in section 4.4.2) prevented any new buildings. As a result, there was a perceived shortage of housing in the village: an issue that was felt acutely during the Chinese New Year when absent family members would return.

4.3.2 Comparing shorter-term and longer-term mobility

The main reasons cited for leaving the village on a short-duration or cyclical basis revolved around bettering livelihoods and for personal (social and family) reasons. Figure 4-6 (n=29, one observation excluded as incomplete) shows that the main reasons cited for employing this type of mobility were an inability to earn good money through agriculture (10), better job opportunities / ability to earn more money elsewhere (eight) and low incomes locally (seven). The next most commonly cited reasons related

to family (they were too far away or moving to be closer to family) and other, of which three were for caring for children or grandchildren and four related to education (attending school or college for example).

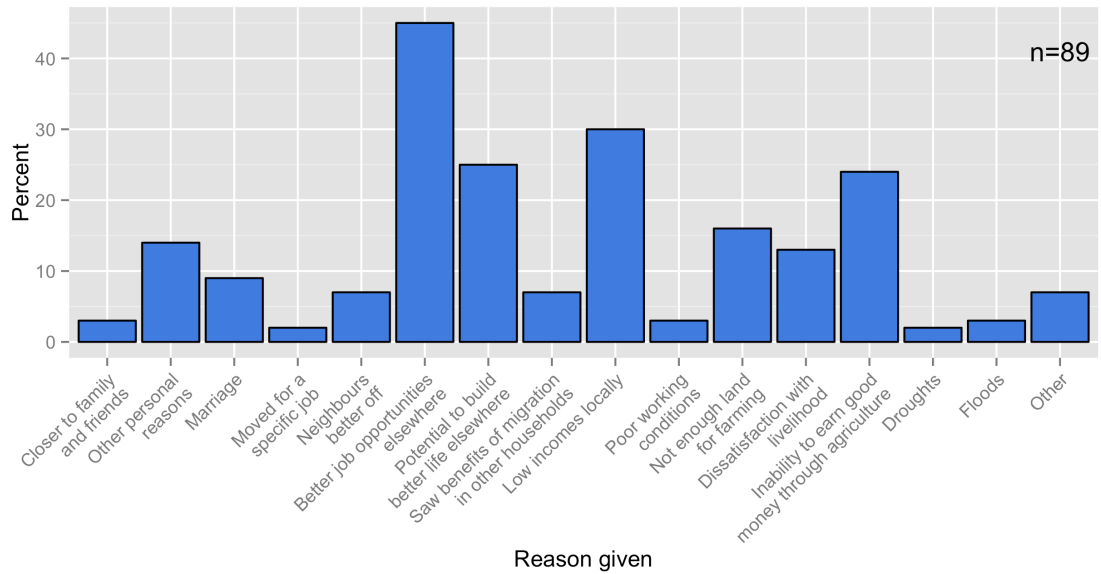
Figure 4-6: Factors considered important in influencing individual shorter-term migration decisions*.



*Responses only sought from households that indicated at least one member had participated in shorter-term migration at some point in the last year. Participants selected the up to five reasons from a list of thirty possible reasons. Answers were either provided by the migrant themselves or a proxy respondent if the migrant was unavailable.

For longer-term migration (n=93, 4 excluded as incomplete), the main reasons cited for leaving were linked to economic rationales (see Figure 4-7). The top four responses either related to an inability to earn a decent livelihood locally through agriculture or the prospect of better opportunities elsewhere. Other reasons that were also selected by a minority of respondents related to dissatisfaction with local livelihoods and a constraint on the amount of land available for farming. Droughts and floods were only cited as a reason influencing a minority of longer-term migration decisions.

Figure 4-7: Factors considered important in influencing individual longer-term migration decisions*.



*Responses only sought from households that indicated at least one member had participated in longer-term migration some point in the last 10 years and had not returned. Participants selected the up to five reasons from a list of thirty possible reasons. Answers provided by a proxy respondent.

Comparing the two figures (Figure 4-6 and Figure 4-7), two issues are worth highlighting at this stage. For households employing circular or shorter-duration mobility, one can infer that, over shorter spatial and temporal scales, local context seems slightly more visible in regard to the decision-making process. For example, personal reasons, moving to be closer to family and friends as well as floods and droughts are all selected more frequently. In contrast, longer-term moves seem more focused on larger life events such as work, earning a decent livelihood and marriage for example. The local environmental context and moving to see family and friends are not selected as frequently.

Second, the reasons given are a mix of individual and structural drivers. For example, the conditions for the economic reasons given are structural (wage differentials and stagnating rural incomes for example) but the desire to improve ones livelihood is distinctly personal or individual. Similarly, the detail provided in the 'Other' category relates to care responsibilities for children and grandchildren and accessing education. Educational access is structured in China through the *Hukou* registration. Accessing schooling and entrance exams for high school is much more difficult for migrants. As a result many children of rural migrants return to their home village for junior school and the entrance exam to access high school.

The similarities and differences in the reasons provided when comparing the different types (longer-term and shorter-term) of migration at an individual level with the general reasons perceived as important (see Figure 4-3 above) are interesting. The two issues that were selected by all participants as an influence over migration decisions in general (*Hukou* registration and restrictions on new building homes) were completely absent from the reasons provided concerning shorter-term migration decisions. This suggests that respondents use a different set of logics when responding to questions about migration reasoning more generally compared to those about specific occurrences (Goffman, 1974; Hoffman, 2011; Schön and Rein, 1994). For general questions the respondents are perhaps echoing common (state) narratives about the issues influencing migration whereas, in specific cases, they draw much more on their own experience.

Interviews with those who have worked or are working away provide further insight into the reasons why people chose to leave their village. Wang Chung has lived in the village all of his life earning a living through teaching and administration within the local government. Wang Chung is 68 with a wife and at least two children. In addition to his clerical work, Wang Chung maintains 14 mu of farmland, which is considerably larger than the average plot size for Wanzhuang (8.35 mu), which is maintained by his wife when he works away. Wang Chung has always practiced a diversified livelihood and currently works in Shanghai as an accountancy clerk for an infrastructure company. Wang Chung explained that his motives for practicing this type of lifestyle were for economic and security reasons. Farming provides only limited income; added to this are the risks (particularly in summer) that the income can be reduced through hazards such as floods or droughts (20140204 Interview Wang Chung).

In Dongdian, Pan Hua described her livelihood and the working practices of her husband. Pan Hua's family have between 5 and 7.5 mu of land, which is below the average of 8.9 for the village. Pan Hua stays in the village and farms whilst her husband splits his time between the village and his work outside. Pan Hua has two sons who both work outside the village in factories (and a daughter). Pan Hua's husband first started working outside in 1996, as there was little farming work to be done for large portions of the year. He has maintained this lifestyle up to the present day although the income he derives from this outside work is not a lot. When describing the impact of her husband working outside, Pan Hua said that, 'more or less if working outside life is better. If stay here just enough for food' (20140205 Interview Pan Hua).

These data show the impact of economic factors in influencing the mobility decisions employed by people. Living and working in multiple locations clearly represent a way for the individuals and households to increase their earning whilst maintaining land and their home within the village (Connelly *et al.*, 2010). Most of the participants that I spoke to in the village liked living there and enjoyed the rural lifestyle. Stretching livelihoods across multiple destinations enables families to stay rural whilst exploiting some of the opportunities that are only available in more urban and developed locations. Comparing these accounts with migrant interviews in Shanghai and temporarily returned migrants in the rural case study sites I was struck by the much more exclusive focus on earning money and finding work. The conditions of work, the hardship and the difficulties of living and working in a more urban area were talked about but only in the background (for example 20130702 Interview Pan Tong-Mu, 20130721 Interview Pan Li, and 20130713 Wang Dao). The *raison d'être* for migration was to work and to earn and this portrayal of migration by the migrants themselves reflected a belief that, through hard work (with an acceptance of some of the harsher realities of migrant life), you could rise up and be successful regardless of your origins (Nguyen and Locke, 2014).

4.3.3 Characterising the (perceived) drivers of mobility

The analysis above suggests, cumulatively, that stagnating local incomes, an inability to increase incomes and improve livelihoods and perceived income differentials with more urbanised areas are important in influencing people's decisions to become mobile. Whilst economic rationales in the decision-making process are undoubtedly important, other non-economic factors also play a role. For shorter-term migration, some contextual factors seem to play a larger perceived role in the decision-making process with personal reasons and environmental perturbations highlighted. For longer-term migration the issues seem more closely aligned to the fulfilment of economic goals within people's lives. The importance of earning a good wage and using mobility to improve ones lot in life, to pull yourself up by your boot straps, was a consistent theme that emerged from almost all of the interviews undertaken with migrants and the residents of the case study sites. The belief that, through hard work, one could achieve great things seems to reflect a very specific (state) narrative.

Comparing the reasons for migration, there appears to be a difference in the way in which respondents think about migration more generally compared to specifically. At a general level, common narratives are employed whereas for specific instances, experience and personal insight is called upon. This insight has important implications for migration research that are discussed in more detail in sections 7.3.1 and 7.3.3. For

both shorter- and longer-term mobility individuals have been able to convert their resources into mobility endowments and mobility entitlements to access opportunities available in the rapidly developing Chinese economy. Whether the movement type is of a shorter- or longer-term nature, individuals are using migration to obviate the stagnating incomes in rural areas and access better-paid work in urban areas. Some institutional factors such as *Hukou* and maintaining a claim on family land are not perceived to be important when related to specific migration events. Juxtaposing these findings with those concerning the less mobile members of the population (discussed in section 4.2) begins to reveal the differentiated impact of institutions on socially distinct actors within the case study sites and is addressed in more detail below.

4.4 Role of institutions in mediating mobility

Leach *et al* (1999) highlight the importance of institutions as mediating environment society relations. They argue that social communities are dynamic and internally differentiated with the priorities and claims of social actors located differently in power relations that may be highly contested. Institutions (in the broadest sense) act in diverse settings and at multiple levels to influence who has access to and control over resources. Similarly, Adger (2000: 354), in his seminal article on the links between social and ecological resilience, asserts,

[s]ocial resilience is institutionally determined, in the sense that institutions permeate all social systems and institutions fundamentally determine the economic system in terms of its structure and distribution of assets.

Leach and colleagues and Adger argue that institutions are crucial in mediating access to and control of resources and the processes through which these resources are mapped on to a variety of (mobility) endowments and entitlements. A similar thread is also adopted by Fan (2004) who contends that the study of migration in China must include institutions owing to the legacy of the socialist era control instruments such as the *Hukou* system. In terms of mobility, at the formal level *Hukou* registration, welfare support and education access influence mobility directly and indirectly. At an informal level, gender and intra-household structures are also highly salient. The roles that are ascribed to individuals within the household, the norms and expectations of people to live up to and fulfil those roles, are very important in influencing who is and is not mobile.

In this section I address a range of institutions that mediate the processes through which resources (both farm and off-farm) are mapped on to mobility endowments and mobility entitlements. Specifically, I focus on formal institutions (*Hukou*, access to

social protection schemes and education), village institutions (the New Village redesign) and household institutions (including gendered roles and the changing nature of the household).

4.4.1 State institutions

Hukou

The role of the Household Registration System or *Hukou* in structuring mobility in China is well documented (see, for example, Cai, 2003; Chan, 1996; Chan, 2010b; Chan and Zhang, 1999; Fan, 2002; Fan, 2004; Logan, 2008; Murphy, 2002; Roberts *et al.*, 2004; Unger, 2002; Wang, Xiaozhou *et al.*, 2013; Wu, 2010; Zhang, 2008; Zhang and Tao, 2012) and is also discussed in Appendix 4. As the reforms in China have progressed so the influence of the *Hukou* system as a means to control movement has decreased. However, the *Hukou* system still has a profound influence on mobility both directly and indirectly. Zhang (2008: 467) stresses that continuities from the 'pre-reform system continue to shape current urban development' whilst Fan (2004: 285) argues that the state is empowered by the pre-reform socialist control instruments and uses these to maintain a significant influence over the 'production, distribution and access to resources'. The *Hukou* system exerts an influence primarily in two forms: directly on the population and indirectly by restricting access to other forms of social welfare support (Demurger and Xu, 2013).

The mobility of the younger generation appears to have been strongly influenced by structural changes at the societal level in China. The reforms that China has pursued over the last 35 years have seen movement restrictions relax gradually from the 1980s onwards. The easing of movement restrictions on one hand and other structural factors encouraging movement on the other has seen a corresponding increase in the number of people migrating (see Table 3-4). In the case study sites the vast majority of people who have moved away are under the age of 35. This suggests that the easing of movement restrictions from the late 1980s onwards may have acted to segment the village population. People under a certain age felt able and willing to leave (regardless of the reason), at a time when mobility is traditionally high (at the end of schooling, looking for employment or around the time of marriage). This pattern appears to have persisted, most of the young people leave the village once they reach their 20s and the majority will have left by the time they are 35 years old. This type of demographically structured rural mobility is not uncommon in China and has been documented in a number of studies on migration in China (see, for example, Sun and Fan, 2010; Taylor, 2011; Wang and Fan, 2006; Zhao, 2005). Older people, in contrast, were generally unable to leave the rural areas due to the more stringent movement restrictions, even

at points in their life where levels of mobility would have been higher in a less restricted environment.

Hukou and its interaction with other state structures

The *Hukou* system exerts an influence indirectly by limiting access to other forms of state support. These forms of state support include access to poverty alleviation programmes, education and health services. In urban areas access to education is often restricted for children of rural families who do not possess an urban *Hukou* registration. As discussed above (see section 4.2.2), availability of poverty relief programmes (such as the *Wu Bao Hu* or *Di Bao Hu*) are accessible to those residing in the same location as their *Hukou* registration. The linking of social welfare support with *Hukou* and current residence strongly limits the mobility of those requiring social welfare support. In addition, the *Wu Bao Hu* or *Di Bao Hu* programmes provide only a basic standard of living, thus limiting access to resources reducing the capabilities of individuals to migrate. In sum, the mobility of those relying on social support programmes are strongly structured (in a negative sense) by the *Hukou* system.

Similarly, access to health services is also mediated through one's *Hukou* registration (see also section 4.2.2). The costs of health services in locations that are not within the same locale as their *Hukou* registration are higher. Access to health services reveals a further discrimination that rural residents face when compared to their urban cousins. Only basic services are available in rural areas and those suffering from serious or more complex illness will often have to travel to urban centres to get appropriate treatment. As a result, the treatment is only available in locations away from one's *Hukou* registration, reducing the amount of subsidy the state is prepared to offer.

Lastly, access to education is more restricted for children of rural residents residing in urban areas compared to their urban cousins (Chan, 2013; He *et al.*, 2010). Government regulations state that children are entitled to 9 years of compulsory free education. However, the budget is allocated through local government and non-transferable. Urban schools with limited budgets are often reluctant to accept children from a province other than that in which their *Hukou* is registered. In addition, an enrolment or tuition fee is also required per semester and some schools also ask parents for an 'education endorsement fee' in order to secure access for their children. These fees can be prohibitive for rural families and act as a significant barrier for their children to attend a local school. Furthermore, college entrance exams are required to be sat in the home province of the candidate (Demurger and Xu, 2013; Liang and Chen, 2007; Miller, 2012).

As a result of the restrictions described above, the children of rural migrants commonly spend a significant amount of time being raised by their grandparents in order to access the much more affordable schools in their home province (Connelly *et al.*, 2011: 284). Supporting their grandchildren through school can cause problems, as many rural grandparents are illiterate and unable to provide much educational support. For example, an interviewee, when describing his children's schooling, stated that,

She [daughter] did very poorly in study. At that time, my wife and I went out to work, no one can take care of the children in their studies at home, and they did poorly in their studies. When my son was in elementary school, he did well in study. ... Yes, we didn't go out to work at that time, it is better for him that we looked after him at home. When he was in junior high school, no one looked after him, and his performance in study was bad (20140203 Interview Wang Zhou).

The impact of this dislocated family life on the children, parents and grandparents has been postulated to have a number of impacts (both positive and negative). For the grandparents, their burden (provision of food, clothing, shelter, effort and responsibility) is increased due to the additional number of people requiring care. The additional workload can be partly offset through increased remittances from those working outside. Echoing the concerns raised in the quote above, Demurger and Xu (2013: 6) highlight the potential impact on the child's educational attainment in a working paper exploring the impact of left behind children on return migration decisions. Other issues mentioned in the paper associated with this type of dislocated family arrangement include children's psychological wellbeing and health condition although the evidence appears mixed and inconclusive (in terms of positive or negative outcomes).

The type of skipped generation family arrangement described above results, in part, from the discriminatory way in which educational access is structured. The demands placed on grandparents who have to look after grandchildren, parents who live away from their children and might only see them once or twice a year and the children themselves whose educational attainment might suffer are high. Furthermore, the expectations and norms associated with this sort of family arrangement highlight the importance of maintaining a family presence in one's home village to ensure continued access to certain services. The grandparents, in providing access to (state) services are enabling their children to work and exploit opportunities (through mobility) that may not otherwise have been available to them if they had to invest more time in caring for their children. In facilitating access in this way, the mobility of the grandparents is likely to be more constrained as the location of the home (the physical asset) is required to enable the grandchild(ren) to access schooling and the grandparents are required to provide support and caregiving.

4.4.2 Village institutions

New Village Redesign

Owing to China's increasing population, urban expansion and declining amount of farmland the pressure on China to ensure it can feed itself is increasing. In response to these threats, the Government has adopted a number of measures to ensure that the amount of farmland does not drop below a 120 million hectares threshold⁵⁰. In 2005, the Ministry of Land and Resources in China proposed the 'increasing vs. decreasing balance' land use policy that was formally adopted in 2010. This policy seeks to balance urban expansion (and loss of farmland) with rationalisation of rural areas that releases farmland. The overall aim being to ensure that no additional farmland is lost. One of the key ways in which rural construction land can be released back to farmland is to consolidate villages. This consolidation or spatial reorganisation can take a number of forms. For example, cities and towns can be allowed to expand to subsume villages on their borders or the population of whole villages can be relocated to other (expanded villages or urban larger areas). The formerly occupied settlements are then demolished and the land is returned to farming⁵¹ (Li *et al.*, 2014; Long, 2014; Long *et al.*, 2012; Long *et al.*, 2010).

One of the interesting topics of discussion that arose during conversations with the villagers was the possible redesign or reorganisation of the village. There was much confusion about what the scheme entailed among the interviewees. For example, Wang Bao-Zhi reported that the village has been included under the New Village Redesign project or the New Village Rebuild project. The project was scheduled to begin last year but was postponed. The overall aim of the project is to redesign and rebuild the village during which time it is possible to increase the housing footprint and decrease the farming footprint of individual plots if required or vice versa (20140203 Interview Wang Bao-Zhi). Alternatively, the purpose of the scheme was to rationalize local villages into larger settlements to free up farmland. The following is an excerpt from an interview with Wang Zhou.

RA: Will you build the house before or after the new countryside planning [Chinese policy for developing the rural part of the country]?

Wang Hong-Li: The policy doesn't permit the house project.

⁵⁰ The Chinese government considers 120 million hectares of farmland as the 'red line' to maintain self-sufficiency (also assuming a degree of overseas imports) in terms of ensuring enough arable land is available to provide grain security and feed the population (Xinhua News Agency, 2014).

⁵¹ This practice also provides a means for local administrations to boost their own income (see for example Long *et al.*, 2012; Miller, 2012: 63-87).

RA: Doesn't permit?

Wang Hong-Li: Yeah.

Other (O): The government would plan and build new houses, and then you will buy them. And the government will decorate them, and you shall pay money to buy the house.

RA: The government doesn't permit you to build the house, right?

Wang Hong-Li: Yes, if it permitted to build the house, I would have built the house long time ago. Even I must borrow money from others, I would do (20140203 Interview Wang Zhou).

Wan Hao-Cun⁵² who was present during some of the interviews, stated that

This is the plan of our village, new country planning. The government decides to move the village (20140203 Interview Wang Hong-Li).

These two extracts (from the same site) indicate to some degree the level of confusion that surrounds the scheme. Some respondents thought the scheme would result in the relocation of the village whereas others felt that the scheme would mean renovation or rebuilding of the existing housing stock. Aside from the confusion over the nature of the scheme, a key point that emerged from the discussion and the rural appraisal activities (20130417 RRA6DD and 20130503 RRA6WZ) was the prohibition on new building or building renovation that was associated with the scheme. This restriction on building and renovation has effectively stymied village growth, investment and improvement reducing the prospect of local employment outside of the existing agricultural opportunities.

An important consequence of the moratorium is to prevent families demonstrating the eligibility of sons for marriage. In rural villages, the ability of the son's family to demonstrate financial eligibility is paramount in attracting a good bride, one of the most important ways of doing this is through the provision of suitable housing (either renovating existing homes or new) (Murphy, 2002; Yangang and Jisheng, 2014). For example, in a survey of four rural villages in Zhejiang province, Sargeson (2002: 942) reported that 80 per cent of respondents thought that a new house was advantageous in finding a wife arguing that '[n]o women would marry a man without a new house'.

⁵² Wan Hao-Cun (pseudonym used to protect confidentiality) is a local cadre responsible for security and order within the village administration; the closest equivalent of his role would be a Warden (*Dian Zhang* / 典狱长). Wan Hao-Cun accompanied me on some of my interviews in Wanzhuang, helped to facilitate the survey questionnaire and participated in the RRA activities.

The impacts of a policy that restricts building in a rural setting reduce the abilities of families to demonstrate their wealth and 'face', thereby increasing the incentives of young people to leave creating a feedback. In effect the policy is stating 'your future lies elsewhere'.

The impacts of the scheme as it stands are likely to increase the tendency of people to leave the village and decrease the attractiveness for people to return. Over longer time frames, and if the scheme is implemented in a way that requires relocation, then the ability of villagers to exercise legitimate and effective command over their residence location is rendered to nothing, highlighting the power that the state retains over its citizens (local and national) in certain circumstances. In other words, the role of the local government and its interpretation of national policy will threaten the entitlement of villagers to remain in their village, to be near their farmland and to grow old in their family homes highlighting the importance of institutions in mediating certain forms of movement. The potential impact of the New Village Redesign scheme highlights the importance remaining in place or staying put as an important element when considering issues of mobility and migration.

Land tenure

China has a unique land tenure system, the Household Responsibility System. Under this system, village collectives own the farmland and plots are leased to households for fixed term contracts⁵³. Land was allocated based on membership of the village and parcelled up on the basis of household size. Egalitarian principles further subdivided each household's plot based on criteria such as soil fertility, access to irrigation and location. Subsequently, at a village level these allocations would be revisited to take into account changing village population (for instance the last reallocation of land in the case study sites was during the 1990s). Within the household, as new families formed, the plots would be divided amongst siblings. This process of allocating land has resulted in highly fragmented and distributed plots of land for households (Tilt, 2008; Zhang and Donaldson, 2012).

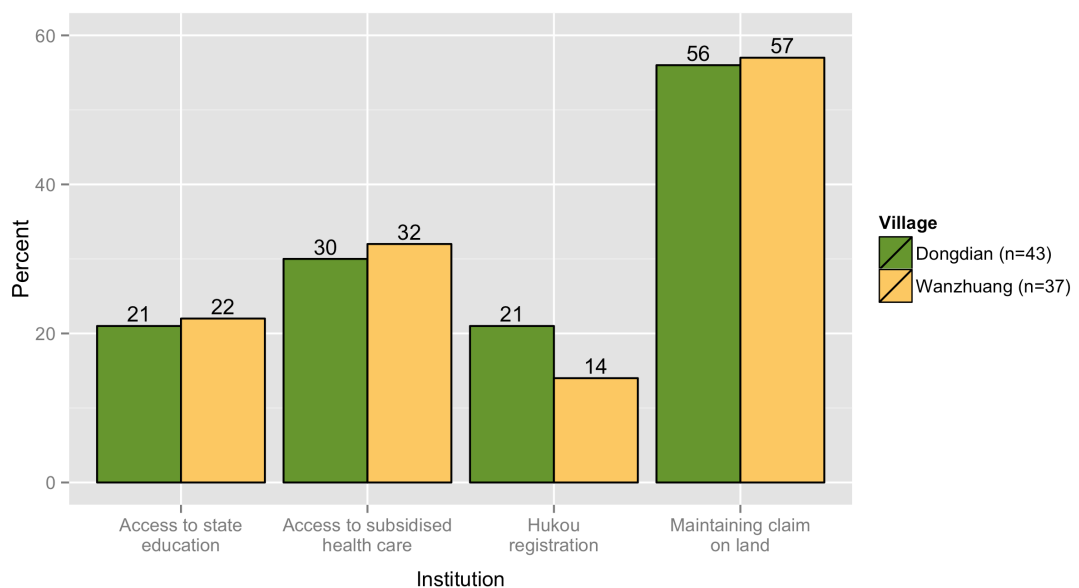
The survey sought information on whether four institutional issues widely cited as influencing mobility decisions were important. Although the institutional factors are not discrete (accessing health care and *Hukou* registration are linked for example), the results do provide an indication of the relative importance ascribed to these issues when individuals and households are making decisions about their mobility. The plot below (Figure 4-8) shows that, of the four issues, 'maintaining a claim on land' is the

⁵³ Originally the Household Responsibility System granted contracts for 5 years. This was increased to 15 years in 1984 and 30 years in 1993 (Tilt, 2008).

most commonly selected institutional issue followed by access to state subsidized health care and education. *Hukou* is considered the least important of the four factors.

The results have some interesting implications regarding the mobility for families and individual members. For example, if younger generations were to leave the household this places a greater onus on the remaining member to stay in order to maintain the legitimacy of claims over land in the village, ‘their ultimate source of financial security’ (Miller, 2012: 75; see, also, Cook 2002). There is an expectation and obligation on the remaining family members to stay although this cost is offset through potential payments in the form of remittances from those members working away. For those working away from the village, remittances provide an important means to demonstrate filial piety and provide support even though they are physically absent. Furthermore, remittances also provide a means through which absent family members can maintain their (intra)family entitlement if and when the household is divided (Murphy, 2002).

Figure 4-8: Consideration of four key institutional issues as a factor influencing migration decisions (multiple responses possible) for both case study sites.



Interestingly these findings differ significantly when compared to responses that sought opinion on general issues influencing migration and specific reasons concerning a decision to migrate (see Figure 4-3, Figure 4-6 and Figure 4-7 respectively). The difference between these responses is most likely attributed to two different reasons. In Figure 4-3 respondents indicated that *Hukou* registration was a key factor influencing decisions concerning migration whilst maintaining a claim on land was rarely selected. Explanations for this apparent contradiction are likely to centre on the interlinkages between the different factors. For example, Demuger and Xu (2011: 1847) refer to the

'complex and inter-related systems of household registration (*Hukou*) and rural land tenure'. All of the institutional factors are predicated on *de jure* residence, and the different responses at different points in the survey are capturing the same issue but through different means. Secondly, and discussed previously in section 4.3.2, respondents could be using a different set of logics to explain specific migration events compared to questions concerning migration in general (more likely to pick up on broader narratives concerning migration) (Goffman, 1974; Hoffman, 2011; Schön and Rein, 1994).

Previous studies exploring the impact of land tenure on mobility decisions have found mixed results. Mullan *et al.* (2011) examine the influence of land tenure arrangements in rural China and conclude that incomplete property rights⁵⁴ have a negative impact on migration in certain circumstances. Land tenure (in addition to the *Hukou* system) is also a factor emphasised by Demurger and Xu (2011) who highlight it as a significant constraint on increased mobility in China. In contrast, Zhang and Donaldson (2012) argue that the current land tenure system in China certainly does not hinder mobility, as other factors are considerably more important. On the contrary, they argue that the current system and land entitlement offers rural migrants a form of social security that facilitates mobility. Evidence from this research suggests that land tenure is factor influencing migration decisions although it works in different ways for different people. The differentiated outcomes on mobility associated with land tenure arrangements within a household highlight the importance of detail and an understanding of the dynamics of intra-household relationships. Such details are often not well represented, if at all, in existing studies, which tend to focus on the household as the lowest unit of analysis (see, for example, Mullan *et al.*, 2011).

4.4.3 Household structures and gendered differences

Declining fertility, an aging population, rapid economic and social change, and political reform provide the backdrop for dramatic shifts in the household and family structure within rural China over the last 20 to 30 years. Households are becoming smaller and more nuclear (Zhang, 2002) with increases in one generation and skipped generation households and decreases in multi-generation households (He and Ye, 2014).

Furthermore, families are becoming more dispersed, owing to the increase in mobility especially in working age adults who were brought up in rural areas but elect to work in urban centres (Guo *et al.*, 2009; Silverstein *et al.*, 2006). Despite these shifts,

⁵⁴ In this context, the authors use the term 'incomplete property rights' to describe the process whereby land use rights have gradually come to resemble private property in practice although aspects of the former communal system remain.

traditional values such as reciprocity (*bao*) and filial piety (*xiao*)⁵⁵ remain strong and the family is still the primary provider of social welfare support in many locations in China (Qi, 2014; Xu *et al.*, 2007).

The interaction of the socially transformative forces China is currently experiencing with the more traditional aspects of Chinese society are producing some interesting dynamics. For example, the social norm of filial piety is increasingly balanced by grandparents caring for grandchildren in a clear break from historical practices (Chen *et al.*, 2011). Such dynamics are in evidence in the case study sites with nine per cent of households caring for children who are not their own closely mirroring analysis of large-scale survey that explored residential patterns (*ibid* 2011: 578). The impact of this type of arrangement has been discussed above and can have both positive and negative impacts on mobility for the remaining members of the household. Similarly, the tradition of the adult sons living with their parents in multigenerational households to participate in the household economy and share labour and resources have also declined sharply over the last 20 or 30 years (Silverstein *et al.*, 2006). The physical absence of children (sons) reduces the amount of instrumental help available although this is often compensated through an increase in the amount of financial support available (Guo *et al.*, 2009). In the case study sites, 46 per cent of households were either one or two person suggesting that the practice of multigenerational households is decreasing, echoing the findings of Silverstein *et al* (2006). Interviews with migrants residing in Shanghai support the thesis offered by Guo *et al* (2009) with remittances and financial support often provided in the absence of more instrumental support.

The changes described above are also likely to have significant gendered impacts. For example, the increasing burden of caring for families with either older or younger dependents is likely to fall predominantly on the female members of the household. As highlighted previously, Pan Lijuan and her husband care for four grandchildren and an elderly uncle. However, the primary responsibility for feeding, clothing and ensuring the grandchildren get to and from school rests with her. She describes her life as 'very tiring' and 'quite busy'. The support provided by Pan Lijuan and her husband was supported through financial remittances from their children. However, the decisions about how to spend the money are likely to rest with the husband (as per a patriarchal society) and are unlikely to be used to reduce the physical burden of caring. In a study on the level of intergeneration support received by rural elders in Anhui province from migrant children, Guo *et al.* (2009) found that the expectation on sons is to provide financial support, whilst the expectation on daughters and daughters-in-law is to provide

⁵⁵ Filial piety emphasises the responsibility of children to care for their parents into old age (see Sung 1998).

personal care and perform household chores. The impact of mobility on this gender division is to reduce the availability of instrumental support provided by the next generation of female family members thus increasing the burden on the remaining female family members. Conversely, the role of the son in providing financial support can be maintained regardless of the physical dislocation.

4.4.4 Crucial role of institutions in mediating mobility

Institutions are crucial in both determining who is and is not mobile. The analysis above draws out the role that formal institutions such as *Hukou* play in addition to health, education and social support systems that are tied to the *Hukou* registration of individuals. At a village level, the impact of land tenure and the 'increasing vs. decreasing policy' (Long *et al.*, 2012) on village development is also apparent. Within the household itself, the changing nature of family structures and the gendered nature of migration has differentiated impacts on the remaining family members. These institutional factors play a very important role in mediating how households and individuals are able to map social resources on to mobility endowments and mobility entitlements.

Some socially differentiated groups (younger, literate males for example) are more 'privileged' than others and are able to deploy their resources and convert these into mobility potential or mobility itself. However, at a familial and societal level, the expectation on young men from rural villages to migrate for work is very high. In this sense, the expectations of families and the wider society could act to override (in certain circumstances) personal desires to remain in the village or to seek work locally. The degree to which young men chose to go or are compelled to go highlights the importance of capturing immobility entitlements as much as mobility entitlements within the conceptual framing of the research. Clearly, a legitimate and effective command to remain in place or stay put is as important as the entitlement to mobility, if desired. At a more fundamental level, the degree to which individuals elect to migrate or are compelled to migrate raises questions about the agency of individuals and their ability to influence wider institutional forces in China.

Other socially differentiated groups (such as the elderly and infirm or those with caring responsibilities) face the opposite issue and are less able to map their resources on to mobility endowments and mobility entitlements. These groups, with less potential to be mobile should they desire it, are potentially more vulnerable to shocks and stresses such as a flood or drought. Again, assuming that less potential mobility equates to an undesirable outcome is too simplistic. Many elderly residents in the case study sites expressed a strong desire to remain and grow old in the village, with their friends in

familiar surroundings. Adopting roles and functions within the household that appear to reduce their mobility potential enables them to meet other aims and ambitions.

Thinking about this issue at a more theoretical level, the strategies that some elderly residents have adopted can be seen as increasing their immobility endowments the ability to map these on to their immobility entitlements.

A final point to draw out from the analysis above is the fluid nature of the institutions themselves: institutions are not static and do change over time. For example, the *Hukou* system has responded *and* contributed to the rapid change that China, as a country, has experienced over the last 30 years (Chan, 2010b). This change, along with a number of other macro economic developments, in part created the conditions for and in part sustained the large-scale movement of people that China has witnessed. Similarly, the household structures and gendered nature of mobility have gradually shifted over time in a response to changing societal pressures and norms. A point supported by Chant (1998: 5) who argues that the household is a 'geographically and historically dynamic social institution'. Traditional ideas of the multigenerational family and instrumental support expected through notions of *bao* and *xiao* are being altered in response to the emerging values driven by the societal changes China is experiencing. Shared labour, pooling of resources within households and instrumental support, for elders traditionally provided through physical presence, are gradually becoming less common as families are more dispersed. In its place, more monetized forms of support, which can be realised remotely, are becoming increasingly common. Such changes have impacts within the household and, crucially, affect male and female members differently. These iterative relationships create feedbacks and synergies that are apparent at different levels of analysis and discussed in detail in Chapter 6.

4.5 Conclusion

In this chapter, I have argued that mobility is heterogeneous and highly structured. Across the two case study sites I have shown that younger, literate males are amongst the most mobile group. Conversely, the elderly and those who are infirm and poorer are the most immobile. Economic rationales are important but paint and incomplete picture that masks considerable heterogeneity and nuance. Mobility decisions are extremely complex and influenced by a range of processes as well as the type of mobility employed, the actors employing it and the context under which it is employed. The analysis has revealed some interesting interactions such as the implications of the New Village Redesign scheme on household and individual behaviour. These interactions highlight the dynamism of individuals, households and institutions in responding to the context and changing circumstances. Socio-economic and political-

historical context is very important and is apparent through the identification of a number of processes that operate in the locale and in potential destinations encouraging people to use mobility. For example, the inability of rural households in the case study to boost their incomes juxtaposed with the greater earning potential in urban areas set within broader political and historical context of the *Hukou* system and discrimination of registered rural inhabitants.

The dynamic mapping process by which resources are converted to mobility endowments and entitlements are very important in influencing who is mobile and who can convert resources into mobility endowments and mobility entitlements. However, a sole focus on mobility tells only some of the story. Analysis within the case study sites has revealed the importance of *immobility endowments* and *immobility entitlements* as a corollary to mobility endowments and entitlements. Institutions are vital to understand these dynamic processes and help to shed light on why it is that some socially differentiated groups are more mobile than others. The role of household dynamics and gender in structuring mobility or the proposed settlement rationalisation and its impact on the case study sites are good examples of institutions structuring people's behaviour and contributing to the broader dynamics underpinning mobility. The institutions work and cut across different levels; some are state promulgated (such as *Hukou*) and others are more informal (such as gendered household structures). Within this context environmental change is also acting. In the next chapter, I will focus explicitly on the impact of the climatically driven environmental change on people's livelihoods.

5 The endowment and entitlement to mobility and their fit within broader adaptation strategies in the context climatic variability

5.1 Introduction

The previous chapter explored which socially differentiated groups are more likely to be (im)mobile and drew out some of the key determinants of mobility within the case study sites. Decisions about mobility were complex with a number of factors taken into account concerning conditions in the origin and probable destination locations. The chapter also outlined the key role that institutions play in mediating who is and is not mobile. Institutions operate and cut across different levels of analysis, from the national *Hukou* policy and social support schemes to household structures and individual circumstances that produce specific forms of behaviour in regard to mobility (such as the empirical examples in the previous chapter).

In this chapter, I explore the impact of the climatically driven environmental change events on the lives and livelihoods of the inhabitants of the two case study sites. Building on the analysis presented in the previous chapter, I show that the climatically driven environmental perturbations under study influence the inhabitants of the case study sites primarily through agriculture and the instrumental disruption to lives caused by the flood (specifically). However, and despite the impact, the households within the two villages appear well adapted to the types of climatic perturbation experienced and have a number of strategies in place to mitigate the disruptions caused by the changing environment.

Secondly, I show that a variety of coping and adaptive behaviours are utilised within the case study sites including changing agricultural practices, boosting incomes and reducing expenditure and longer-term, planned changes. Coping or response mobility is a feature of households in Wanzhuang and related to the pathways through which environmental changes act on people's lives and livelihoods. Other forms of mobility are used by some households, although always set within a basket of other behaviours. For longer-duration mobility, the signals from environmental change are present but weak. This suggests that the environment is working more as a secondary driver influencing other processes that impact on mobility decisions or acting as a trigger mechanism for those individuals already considering migrating (shorter- or longer-term).

In the third and final section of the chapter I focus on the use of mobility by socially differentiated actors within the two case study sites. Firstly, I compare households with

more mobile members to households with less overall mobility and suggest that mobility does influence the type of responses used. Secondly, I highlight the importance of remittances in helping absent household members provide monetized support. This monetized approach to supporting resident rural household members is a manifestation of the changing economic and social structure of China as it develops and industrialises. Finally, I argue that individuals and households are a focal point upon which many social processes operate. The variety of these social processes, their perceived importance and whether and how they co-occur contribute to the differing levels of resilience within the case study sites. Mobility is one facet within this complex dynamic that can be and is utilised to mediate resilience.

5.2 Characterising the impact of the flood and drought

Section 3.3.3 presented analysis of temperature and precipitation trends more locally to the case study sites including a more detailed characterisation of the nature of the two climatic perturbations under study. To recap, the data show that there has been a small but positively correlated increasing trend in temperature data. The data for precipitation shows a high degree of seasonality with no clear trend overall. The majority of the precipitation falls in the summer months of June, July and August with substantial within and between month variability. In addition, the precipitation data show large positive anomalies that correspond with reported flood events and large, historical negative anomalies. However, the data were not consistent between the two weather stations suggesting high levels of local variation that may not be captured by the dispersed weather stations. Respondents to the survey perceived an increase in drought events and hot spells and a decrease in flood events.

In the following section, I show that the impact of the environmental perturbations is predominantly felt through agriculture, although other impacts (notably on assets were also reported). The impact on agriculture is more homogeneous and severe in Wanzhuang and more heterogeneous with graduated levels of severity in Dongdian. The differing impact on agriculture is attributable to the type and nature of the flood compared to the drought and, I assert, the variations in households' exposure and adaptive capacity. The contrasting levels of severity of the environmental events are borne out through the analysis of the damage to physical assets and impacts on the food availability, health and the economy of the households that were affected. Under almost all measures the impacts of the flood affected more people to a greater extent than the impacts of the drought.

In order to maximise the reliability of the analysis only data from those respondents that stated they could recall the perturbations (n=73) in question is presented below

unless otherwise stated. Overall, 76 per cent (n=38) of respondents in Dongdian recalled the drought event in 2011 compared to a 75 per cent (n=35) recall rate for the 2007 flood event in Wanzhuang. The recall rate for Wanzhuang is quite high for an event that occurred five years ago (at date of data collection) suggesting it was a more significant anomaly in the minds of the respondents compared to the drought event in Dongdian.

5.2.1 Impact on agriculture

Impact of the flood is more severe and universal than the drought

Table 5-1 shows the number of households that reported impacts on crops disaggregated by sown and harvested⁵⁶ crops and by village. In total 68 (36 out of 38 for Dongdian and 32 out of 35 for Wanzhuang) households reported that their crops had been affected out of a usable sample size of 73. The table shows that considerably more sown crops were affected than harvested crops (as would be expected) aggregated across the two sites and for both sites individually. The majority of respondents reported an impact on between one to three crops.

In Dongdian, the impact is spread more evenly between the different number of crops affected compared to Wanzhuang (with less people reporting an impact on three or more crops). Double cropping is practiced in both sites with wheat planted over the winter period and corn and / or soya planted in the summer months. The flooding in 2007 occurred not long after the wheat had been harvested in early June and the soya and corn were planted, as a result the soya and corn crops were most severely affected. The impact of the drought, a longer lasting but slower onset event, was sustained over the course of the year affecting both cropping cycles (wheat and corn and soya). As a result, there are more impacts reported on three crops (as can be seen in Figure 5-1).

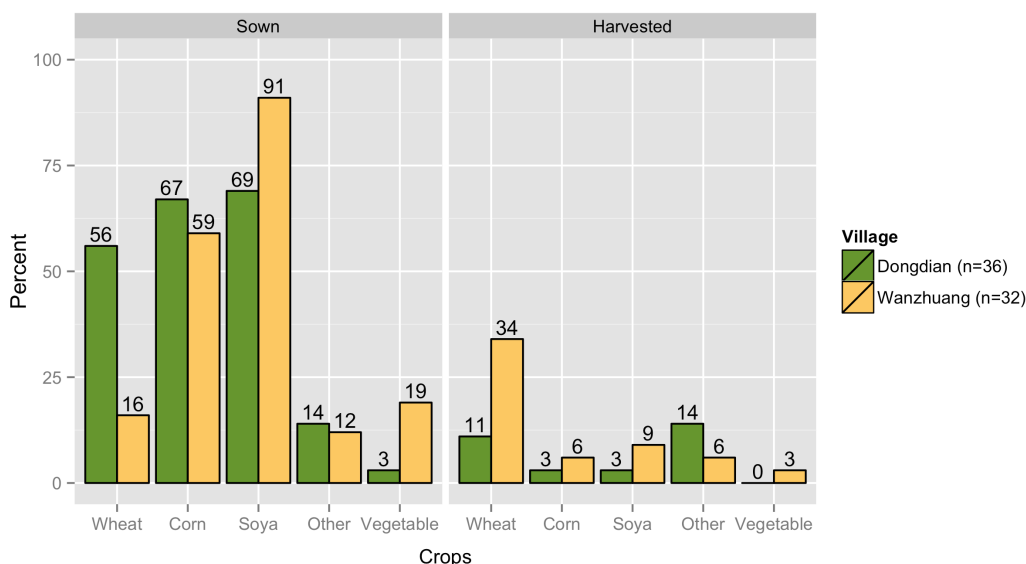
⁵⁶ Harvested crops are those no longer in the ground (for example they could be being stored by households for sale at a later date).

Table 5-1: Reported impact of environmental perturbations on sown and harvested crops for Dongdian (2011 drought) and Wanzhuang (2007 flood).

# of crops affected	Both sites (n=73)		Dongdian (n=38)		Wanzhuang (n=35)	
	Sown	Harvested	Sown	Harvested	Sown	Harvested
0	7%	64%	5%	71%	9%	57%
1	23%	32%	21%	26%	26%	37%
2	45%	0%	45%	0%	46%	0%
3	23%	4%	29%	3%	17%	6%
4	1%	0%	0%	0%	3%	0%
Total*	99%	100%	100%	100%	101%	100%

*Some columns do not total 100 per cent due to rounding.

Figure 5-1: Impact of environmental perturbation on sown and harvested crops for Dongdian (2011 drought) and Wanzhuang (2007 flood)*.



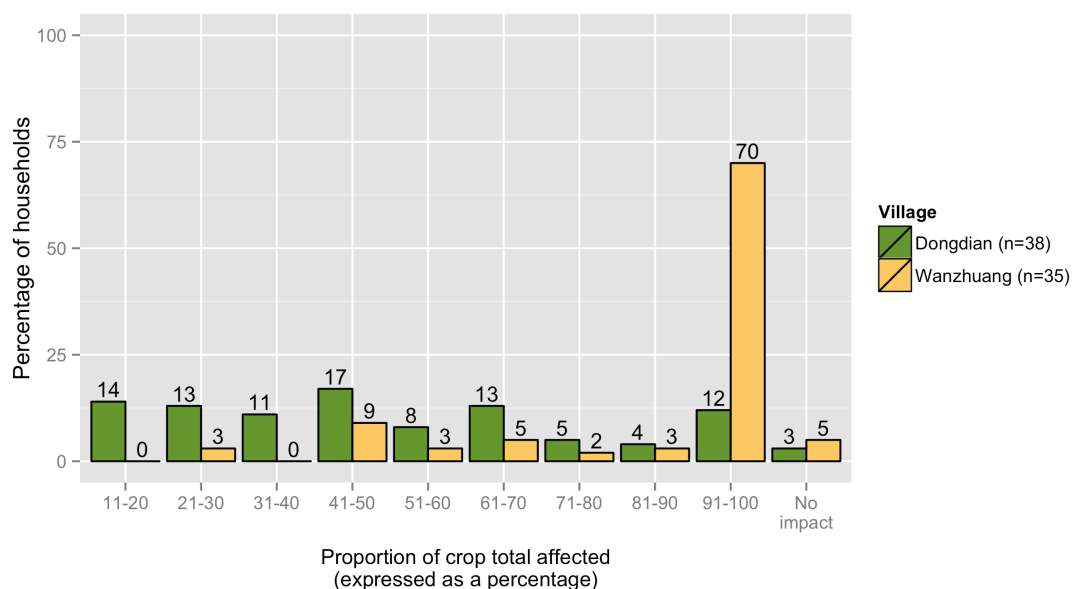
*Values refer to the number of households as a percentage of the total number of households that reported an impact on their crops (not the proportion of crop that was lost).

A different picture emerges when looking at the impact on harvested crops. In Wanzhuang, 15 households (43 per cent of the total) reported an impact at least one harvested crop. In Dongdian, the percentage was substantially lower with only 29 per cent of households reporting an impact on at least one harvested crop. The mechanism of impact of the two events under study provides the most likely an explanation for the differing impact on harvested crops. During the rural appraisal activity exploring the impact of the flood event in Wanzhuang the participants reported that some of the more vulnerable households (the elderly and infirm for example) took longer to harvest, prepare and sell the wheat compared to households with greater labour capacity (20130503 RRA6WZ). For these more vulnerable households, the wheat harvest was lost in the flood due to the longer time it took to harvest and process the crop.

The issues associated with a lack of labour and associated loss of harvested crops are related to the falling numbers of multi-generational households and corresponding decrease in the availability of labour within the household. The analysis indicates that the more monetized approach in providing support to rural households outlined in the previous chapter is not without costs, one of which is exposure to post harvest crop losses due to flooding. The insight gained from the rural appraisal activities is supported by the analysis from the questionnaire that shows a minority of households in Wanzhuang reporting losses of harvested wheat due to the flood (see Figure 5-1, above). This type of loss does not occur as commonly during a drought event and any post harvest losses to crops are likely to be associated with pests, diseases and issues with improper storage.

Figure 5-2 reveals the proportion of the total crop (expressed as a percentage) affected by the flood or the drought. The analysis shows the high number of people that reported that their entire crop was lost due to the flood in Wanzhuang and the much more varied losses evident in Dongdian under drought conditions.

Figure 5-2: Impact of environmental perturbation on sown crops for Dongdian (2011 drought) and Wanzhuang (2007 flood)*.



*X-axis refers to the proportion of total sown crops affected. Y-axis shows the number of households as a percentage of the total number of households that reported an impact on their crops in addition to those households stating there was no impact.

The difference in the more universal experiences of households in Wanzhuang compared to the more varied impacts experienced in Dongdian arise from two broad issues. First, the comparative severity of the two events under study undoubtedly contributes to some of the variation in evidence (biophysical characteristics of the two

events are discussed in detail in section 3.3.3). The flood event submerged the vast majority of the village's farmland and lasted for about one month; the mortality rate for the crops that were submerged for this period was very high. The drought event, in contrast, worked over a longer time frame but the mortality rate for the crops was not as high or universal. Second, the underlying social heterogeneity within both villages in terms of exposure and ability to manage under conditions of environmental stress also contributes to variations in yield as will be examined below (Adger, 2006; Ajibade *et al.*, 2013; Blaikie, 1994; Garbero and Muttarak, 2013; Smit and Wandel, 2006).

In Dongdian, the social differentiation of households affects their levels of exposure, access to irrigation and other forms of adaptive responses that mediates the impact of the drought to produce the varied impacts shown above. The severity of the flood event in Wanzhuang renders the social-differentiation of households in the village considerably less important in terms of crop impact as the options for mitigation are so constrained and more dependent on biophysical characteristics of the shock.

As stated above, the drought does not appear to have been severe (in terms of its duration and extent) suggesting that it is the absence of precipitation or the presence of heat stress at crucial points in the crop growing cycle that is important in this case (rather than a long-lasting deficiency in water availability). For example, wheat is particularly susceptible to periods of extreme heat and water stress during anthesis (flowering). More generally, within season variations of precipitation and temperature have also been shown as extremely important in explaining variations in yield (Challinor *et al.*, 2005; Slingo *et al.*, 2005). The monthly means and standard deviations for the two closest weather stations show that the driest parts of the year are from October through to April with the summer months providing the majority of the annual precipitation. For both sites, the coefficient of variation for each month is large indicating that the monthly precipitation is highly variable (see Table 5-2).

Table 5-2: Mean monthly precipitation, standard deviation (S.D.) and coefficient of variation (C. of V.) for two proximate weather stations to the case study sites (in mm to 2dp) with the growing season for winter wheat (Wheat G.S.).

Month	Station 58122*			Station 58215*			Wheat G.S.
	Mean	S.D.	C. of V. (%)	Mean	S.D.	C. of V. (%)	
Jan	18.62	18.63	100.09	23.43	19.39	82.77	+
Feb	25.87	19.72	76.21	34.27	23.39	68.23	+
Mar	43.05	33.32	77.39	59.07	37.5	63.48	+
Apr	53.46	40.16	75.12	66.22	47.35	71.51	+
May	62.36	51.56	82.68	77.44	47.37	61.17	+
June	108.34	83.37	76.95	135.03	89.6	66.35	+
Jul	251.14	154.09	61.36	199.15	113.37	59.93	
Aug	134.87	85.08	63.08	115.44	67.53	58.50	
Sept	82.08	62.25	75.83	76.16	55.1	72.35	+
Oct	43.6	37.91	86.96	51.1	46.21	90.42	+
Nov	30.47	27.65	90.73	42.77	41.22	96.37	+
Dec	15.8	14.1	89.21	18.25	16.89	92.52	+
Annual average	72.38	90.82	79.64	74.96	75.91	73.38	

*Time series for station 58122 runs from September 1952 to July 2012 and for station 58215 from January 1955 to July 2012.

The wheat crop is grown through the driest part of the year (September to June), where even small variations in the amount of precipitation are likely to have a significant impact. Discussions with key informants during rural appraisal activities highlighted the importance of April and May in the development of wheat⁵⁷. A rural appraisal activity explored the relationship between crop yield, precipitation and crop water availability, it shows that the reduced yield in the summer of 2011 corresponded with a period of low precipitation and crop water availability (20140416 RRA5DD). The data supports the assertion made that the absence of precipitation at crucial periods in the growth of wheat negatively impacted on yield.

Irrigation is one of the key means to mitigate the effects of below average precipitation. Irrigation infrastructure in Dongdian is not well developed and is not universally available. Villagers rely, predominantly on man-made, artificial ponds and irrigation ditches to retain rainfall, which is then used for irrigation. In Dongdian, 21 out of 46 households in survey stated that they used irrigation in the winter growing season. The average proportion of land that was irrigated by the households in the winter growing season was 82 per cent. The use of irrigation by households will enable them to maintain a water supply for their crops during dry spells if the dry spells do not extend beyond the lifetime of the water bodies used for irrigation. The type of drought

⁵⁷ An informant who accompanied me on a transect walk stated that the critical times for the wheat crop were April and May for a June harvest (20130503 RRA3BWZ).

experienced in Dongdian suggests that irrigation, where available, will have played a key part in minimising the impact on the crops. The use of irrigation by a subset of households within Dongdian provides a plausible explanation to understand part of the variation in losses caused by the drought event (discussed in more detail in section 5.3).

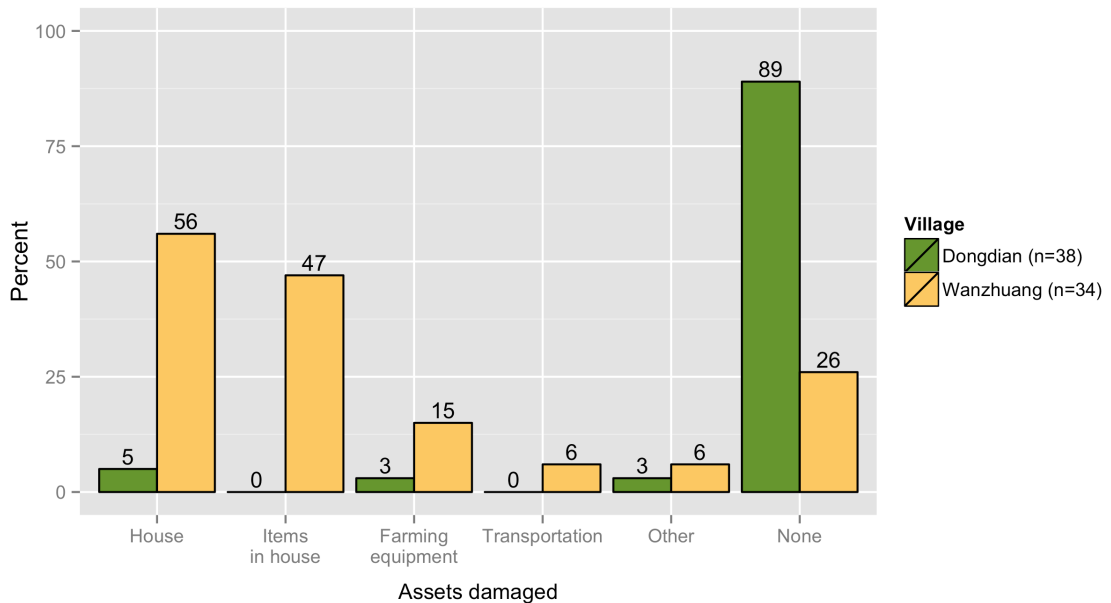
5.2.2 Impact on assets, health and wellbeing

Damage to assets

The two case study sites experienced large differences in damage to physical assets and built infrastructure (see Figure 5-3). In Dongdian, the damage to assets was negligible with the vast majority of households (89 per cent) reporting no damage as a result of the drought. A very small minority of households (five per cent) reported damage to the built infrastructure, which may have been associated with the traditional mud construction drying out and cracking⁵⁸. The only other reported incidences of damage were associated with farm equipment and 'other' (related to water quality so not directly applicable). The data from Dongdian compares markedly with Wanzhuang where only about a quarter of people reported no damage to assets at all. The majority of damage was to people's homes (reported by 56 per cent of respondents) and items within their homes (reported by 47 per cent of respondents).

⁵⁸ These structures are rare in Dongdian and used for non-essential buildings such as outhouses.

Figure 5-3: Per cent of households reporting damage to physical assets for Dongdian (2011 drought) and Wanzhuang (2007 flood)*.



*Y-axis represents the number of households as a percentage of the total number of households that reported damage for each class of physical assets.

At a village level, the difference in damage to infrastructure affected by the two events is also marked. All of the property east of the main north-south road in Wanzhuang was under one to two meters of water during the flood and the majority of land around the village was submerged (the village occupies the highest land so some areas were not inundated). The two main roads, which act as levees protecting the village from annual summer rains and minor flood events, sustained damage and required repair.

Whilst damage to the physical environment is somewhat arbitrary (you can't move a house for example) and dependent on the severity of the flood, moveable items, such as personal possessions and farming equipment, can be protected or relocated if there is capacity within the household to do. So, for example Wang Hong-Li, in recalling the flood impacts, reveals his inability to protect his household items from the house

The production team sent a boat to pick people ... I can remember all. ... Hey, nothing else [in my house] left, all floated away. ... All things in the house floated away and the door was closed (20140203 Interview Wang Hong-Li).

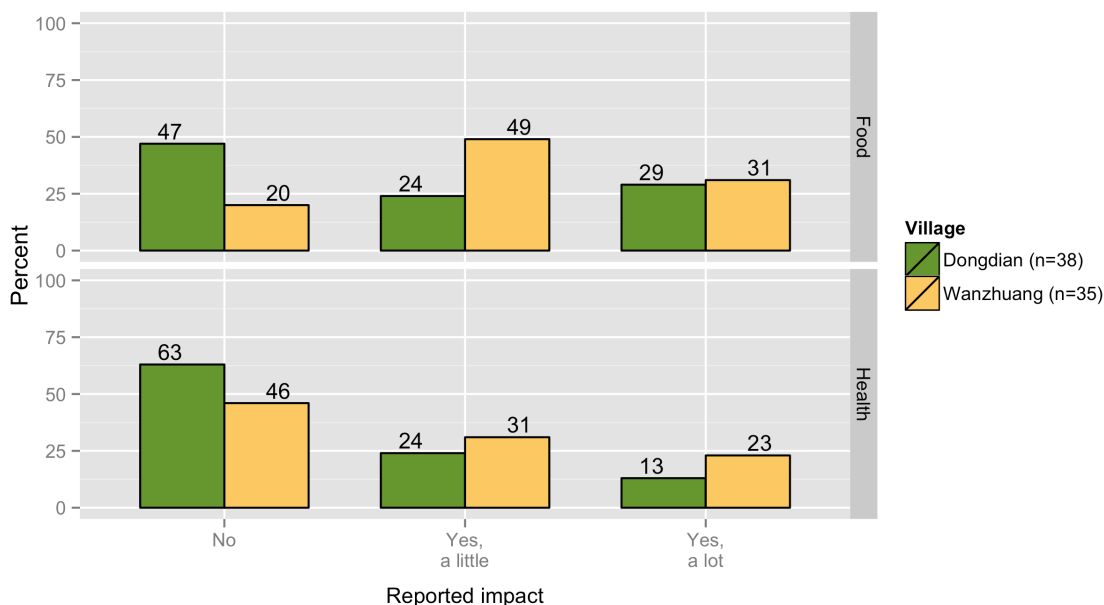
Whereas other households (such as Wang Chung and Wang Dewei) reported taking items of furniture with them or moving the items to high points within the house to reduce the amount of damage that was experienced (20140204 interview Wang Chung and 20140204 Interview Wang Dewei). Further interrogation of the questionnaire data shows that, out of the 19 households in Wanzhuang that reported damage to their

house, 13 also reported damage to items within their house. This suggests that the remainder, six households, were able to prepare for the flood by moving or relocating items within their house indicating a greater ability to cope with the predicted impacts of the flood.

Food, health, and livelihood impacts in Wanzhuang are greater compared to Dongdian

Of the 73 households that reported that they could recall the extreme event, approximately two thirds (48 out of 73) stated that the availability of food had been negatively affected. The largest impact on food availability was in Wanzhuang with 80 per cent of households reporting a decrease as a result of the flood compared to 53 per cent of households in Dongdian (see Figure 5-4). Interestingly across both sites an equivalent number of households stated that the availability of food had decreased a lot. Further analysis of the questionnaire data reveals that the value for the mean proportion of crops affected by the climatic perturbation are higher for the group of households that reported an impact on the availability of food (mean of 75 per cent) compared to those households that report no change in the availability of food (mean of 57 per cent).

Figure 5-4: Per cent of households reporting decreases in the availability of food for consumption and negative impacts on the health of the household members for Dongdian (drought in 2011) and Wanzhuang (flood in 2007).

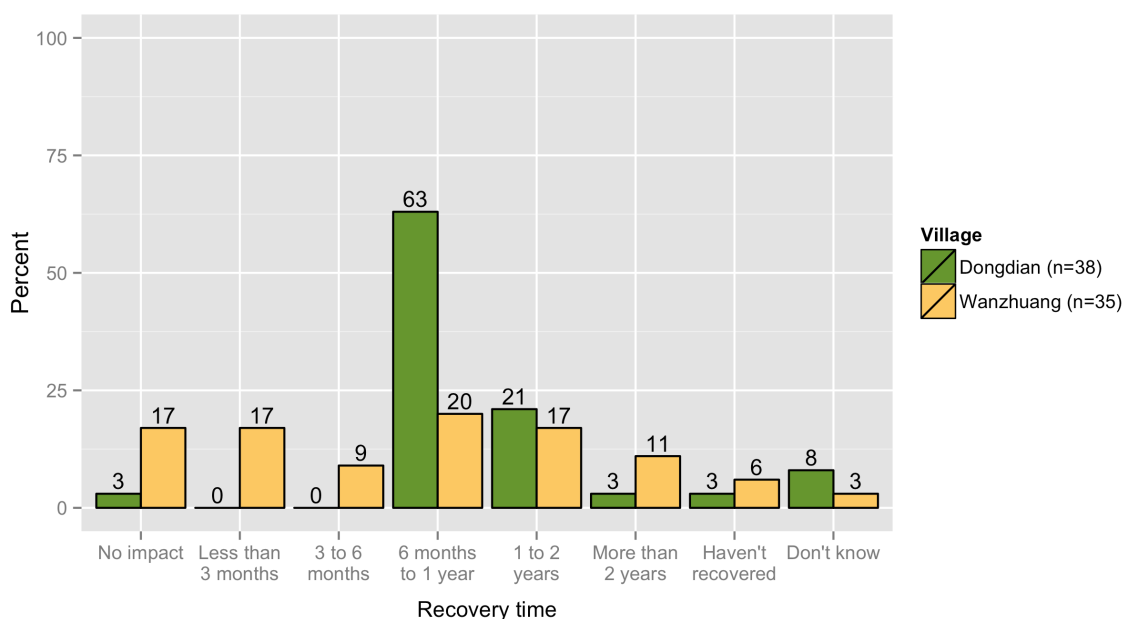


The health impacts that were attributed to the climatic perturbation show a similar overall pattern to the impacts on food availability when comparing between the two case study sites. More households in Wanzhuang (n=19) were affected by poor health compared to Dongdian (n=15). Of those that were affected, seven households reported

one person was adversely affected; 14 households reported that two people were adversely affected and 13 households reported that three or more people were adversely affected.

Both climatically driven environmental perturbations had some sort of impact on respondents' finances. 66 out of 73 households stated that their finances were affected: 83 per cent of respondents in Wanzhuang (n=29) and 97 per cent of respondents in Dongdian (n=37). Of these households: nine recovered to their former position within six months, 31 took between six months and a year, 14 took between one and two years and eight took more than two years or were yet to recover. This breakdown (see Figure 5-5) shows significant differences between the two sites with the majority of Dongdian households (32 out of 38) recovering between six months and two years. The recovery time for Wanzhuang households has a larger spread from less than three months to not yet recovered. Additionally, more households (six) reported no financial impact at all compared to only one household in Dongdian.

Figure 5-5: Reported length of time households took to recover financially from the environmental perturbation for Dongdian (2011 drought) and Wanzhuang (2007 flood)*.



*Y-axis represents the number of households as a percentage of the total number of households. Figures for Dongdian total 101 per cent due to rounding.

The recovery time provides a proxy indication of the impact of the perturbation on people's livelihoods. The majority of households (about 80 per cent) in the two case study sites are completely or somewhat dependent on agriculture for their livelihoods. The impact of the flood or drought event on agriculture (or any change in the environment that disrupts agricultural yield) will be felt within the household economy.

The variation between the two sites suggests that the flood affected some people substantially and others to a considerably lesser extent. The drought, in comparison, appears to have had a more consistent impact across the sample. This is an interesting finding and is unexpected in light of the analysis above that explored the severity of crop losses (see Figure 5-2 above) and reported damage to physical assets (see Figure 5-3 above). The charts appear somewhat contradictory: the amount of crops lost in Wanzhuang was almost universally reported as between 90 and 100 per cent whereas Dongdian losses ranged from 10 to 100 per cent. Similarly, asset losses were much higher in Wanzhuang compared to Dongdian. In the figure above, the more universal response is found for Dongdian whereas the more varied response is for Wanzhuang.

The length of time that each perturbation was active for and the differing types of impact of the flood and drought event are likely to impact on a household's financial circumstances in different ways. The flood was short lived and, once the waters had receded, recovery could begin immediately. Within Wanzhuang, some people were affected substantially (for example their property was damaged, their sown crops lost, and harvested wheat washed away) compared to a minority that reported no crop losses at all. In almost all cases the impact on the sown crop would have been high but the impact on different households more varied based on their other losses and adaptive capacity (discussed in the section 5.3 below). The impact of the drought was not as wide ranging (in terms of variety of impacts), only acting upon crops although longer lasting. Therefore, recovery from the perturbation, framed around agricultural production, took either one (two growing seasons) or two years (four growing seasons).

Follow up interviews provide some additional insight into the findings outlined above especially in regards to the variation evident in the numbers for Wanzhuang. Interviews, particularly with poorer families, suggest that ideas of financial recovery are thought of in terms of the financial support they receive from the state. Wang Hong-Li reported that it takes only two to three months to recover financially (due to the money they receive owing to the *Wu Bao and Di Bao* status of household members or insurance for old age) but replacing damaged furniture and crops took approximately one year (20140203 Interview Wang Hong-Li). Similarly, Wang Dewei stated that there was no financial impact although all of the household's crops were destroyed (20140204 Interview Wang Dewei).

At the other end of the spectrum, 18 per cent of households in Wanzhuang and six per cent of households in Dongdian indicated that it took two years or more to recover from the flood or drought. These households may be conceptualising recovery in different

ways (if at all) owing to the continued hardship they experience on a daily basis. Béné *et al.* (2014), in a review article examining poverty and resilience, refers to the notion of adaptive preferences whereby people learn to live with poverty by suppressing wants and desires. In other words, the households reporting very long recovery times may be expressing the personal processes through which they have adjusted their expectations to cope with deteriorating conditions without ever really recovering.

5.2.3 Differentiated impact of the environmental perturbations

The impacts of the climatically driven environmental perturbations have been felt differently within the villages, this appears to be strongly linked to the mechanism and severity of the events under study. The drought is more universal in that its biophysical impacts are uniform throughout the village compared to the flood, which is more varied. However, the impact of the flood and drought is not just determined by the biophysical characteristics of the perturbation. The biophysical impacts are overlaid on to existing social vulnerability, inequalities and power imbalances as highlighted by a number of authors (see, for example, Cutter *et al.*, 2003; Dercon and Krishnan, 2000; Langridge *et al.*, 2006; Leach *et al.*, 1999; Nguyen and James, 2013; Samir, 2013; Sen, 1981; Sen, 1984). For example, access to resources, agricultural dependency and livelihood diversification, availability of irrigation and the existing asset base of households are all important in influencing the severity of impact and recovery from the flood or drought. In addition, it is important to also bear in mind the more random and unpredictable nature of events and their impacts in influencing individual outcomes (Carter and Barrett, 2006).

Comparing the severity of impact with the length of time taken to recover financially provides one example of the mediating role of social context and personal circumstances. The impact of drought in Dongdian on crop mortality was more heterogeneous compared to the impacts of the flood, which were more severe and homogeneous. However, this pattern is not replicated in the financial recovery time with a much more varied response witnessed in Wanzhuang compared to Dongdian, where the majority recovered to their pre drought conditions within six months to one year. This temporal variation is extremely interesting and suggests that certain people are more adept at coping and recovering compared to other groups of people. Having said that, the temporal variation cannot be solely attributed to differences in coping and adaptation strategies, as many different factors will influence a particular outcome (including different understandings of financial impact and recovery). The data also suggests that the severity of the impact and the ways in which households cope and recovery is more idiosyncratic than some previous studies (Corbett, 1988; Skoufias,

2003) have implied supporting more recent work (see, for example, Helgeson *et al.*, 2013).

5.3 Coping and adaptation

In this section I focus on some of the key coping and adaptation strategies⁵⁹ that have been adopted by households within the case study sites in response to the environmental perturbations. Specifically, the section focuses on changes to agricultural practices, household strategies to boost income and reduce expenditure, longer-term planned actions and mobility. Households in both sites appear well adapted and utilise a number of strategies to cope with the disruption caused by the climatic perturbations (Paavola, 2008; Smit and Wandel, 2006). Differences in behaviours between the two case study sites are evident however, highlighting the aspects of adaptive capacity that are more relevant to a specific perturbation (such as the selling of assets in the drought context) and others that are applied across the two sites (implying a degree of universality). This analysis of adaptive behaviours touches on the balance between adaptation as development (reducing vulnerability, building adaptive capacity) and adaptation as a more additional/targeted set of specific actions designed to address climate risks (D. Conway 2014, pers. comm., 1st April and also Tanner and Horn-Phathanothai, 2014).

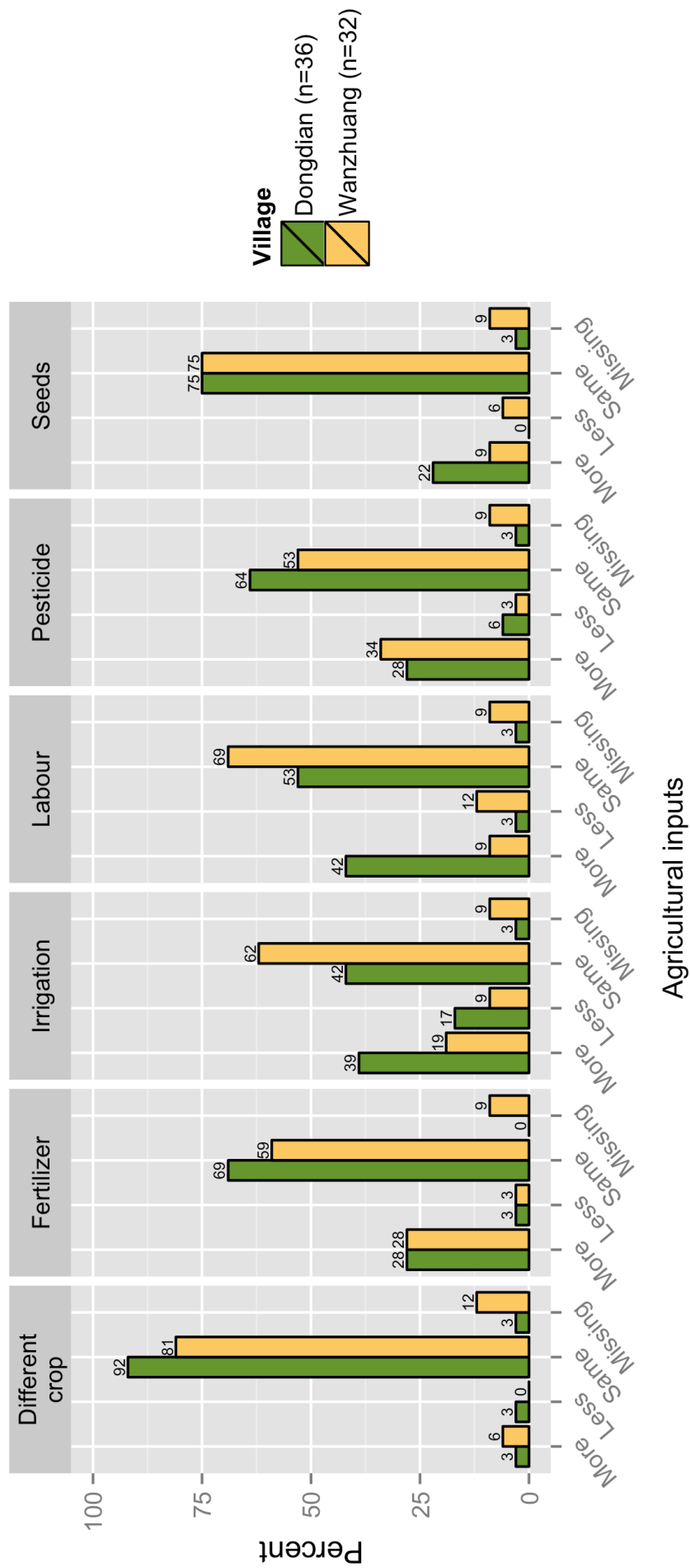
5.3.1 Agricultural adaptation

One of the main ways that farming households respond to changing environmental conditions is changing their farming practices in an attempt to maintain or improve yield and, hence, livelihood outcomes (Mortimore and Adams, 2001; Vincent *et al.*, 2013). Data on farming practices were collected primarily through the rural appraisal activities and the questionnaire⁶⁰. Supplementary questions were also included in the follow up interviews. Figure 5-6 shows the reported changes to a range of inputs (using different crops, irrigation, pesticide, fertilizer, labour and more seeds) compared to a normal year for the two case study sites for those households reporting an impact on crops (n=68).

⁵⁹I regard coping and adaptation strategies as a single continuum ranging from reactive behavior to ensure survival during livelihood shocks and stresses to longer term planned anticipatory behavior. Coping tends to be short term and reactive where as adaptation tends to be viewed as something that has longer-term implications and can be planned or reactive. However, there are overlaps and clearly distinguishing between the concepts in an empirical setting is difficult (Kniveton *et al.*, 2012; Vincent *et al.*, 2013).

⁶⁰ Respondents were screened through two questions: firstly, whether they recalled the extreme event (n=73) and secondly, if the extreme event affected their crops (n=68). Only if the answers to these two questions were positive would subsequent questions on changing inputs be asked.

Figure 5-6: Household responses showing changes in farming inputs. Compares inputs of a hypothetical normal year to the inputs used during the 2011 drought in Dongdian and with inputs used in period following the 2007 flood in Wanzhuang.



A key method of responding to drier conditions as witnessed in Dongdian is to alter the planting times of the main crops. This behaviour has been practiced in Dongdian for both the winter wheat and the summer crops of corn and soya and is also common in other parts of China (Yang *et al.*, 2007). Participants in the rural appraisal activities reported that the planting of winter wheat was delayed by approximately one month and did not occur until the lunar month of September (around mid-October). Similarly the summer crops were also delayed until after the first significant rains, which were late (20130417 RRA7DD & 20130415 RRA3ADD). This behavior provides a relatively cost free means to respond to local variability in the weather and is effective provided the key weather patterns remain within certain acceptable limits (Biggs *et al.*, 2013; Li *et al.*, 2013).

Further changes occurred in the amount of irrigation and labour that were employed. 42 per cent of respondents reported that they used more labour and 39 per cent of respondents reported using more irrigation. In drought conditions, the use of additional irrigation and labour is a common response (Morton, 2007; Pandey *et al.*, 2007; Yang *et al.*, 2007) and one that has been enacted by two fifths of the respondents in Dongdian. Just under a quarter of households (22 per cent) in Dongdian reported using more seeds compared to a normal year. Increasing the amount of seeds sown was identified as a coping strategy households adopt during times of drought. The rationale underpinning this type of adaptive behaviour is to counteract the increased mortality rate of young plants by sowing more seeds.

Looking at these data cumulatively, a clear pattern is visible for a minority of households whereby increasing labour is required to sow more seeds or apply additional irrigation in order to militate against the dry conditions. Rural appraisal data provide further insight into the irrigation behaviour adopted by the households during the dry spell. Water that has been stored in the man-made, artificial ponds and irrigation ditches is utilised to water the crops. The villagers reported renting mechanical pumps to move the water from where it is stored (predominantly around the settlement) to where it is needed. However, the pumps have only limited effectiveness and water cannot be transported long distances. The potential coverage of the pumps and other irrigation measures is about a third of the farmland for the village as a whole (20130415 RRA3ADD).

A total of 59 per cent of respondents reported using the same amount of irrigation or less and 56 per cent of respondents reported using the same amount of labour or less. These data support the conclusions above and indicate that irrigation is possible for certain households whose land is proximate to water bodies and have the financial

resources to rent pumps. Those households unable to increase the amount of water available for irrigation as a result of the drought are likely to farm poorly located land in relation to water bodies and / or lack the financial resources to rent pumps. Therefore, additional labour was not required as the ability to respond to decreased precipitation was constrained. In such a scenario, yields are likely to have decreased as a result of the drought. Alternatively or in addition to the explanation above, for certain households, the amount of irrigation applied in a normal year was adequate and did not change significantly when compared to a drought year. In this scenario it is likely that the existing level of irrigation was adequate to counteract the below average precipitation and maintain yields.

The behavioural responses adopted in Dongdian bear interesting comparison with those practiced in Wanzhuang. Between a quarter and third of respondents in both sites used more fertilizer and pesticides. Of the remainder, the majority of respondents reported using the same amount of fertilizer and pesticides as a normal year. This finding suggests that, as with the irrigation example above, in most cases households either elected to maintain the existing levels of fertilizer and pesticide use or were unable to increase its use beyond current levels. Anecdotal evidence provided through informal conversations and as part of the rural appraisal activities highlighted the prevalence of pests after the flood events. The increase in the amount of pesticide use reported is likely to be an attempt to control pest outbreaks after the flood event to protect the newly planted crop.

The use of more seeds is not a common practice in Wanzhuang suggesting that this type of adaptive behaviour is associated strongly with adaptation to drought specifically. Interestingly, the rural appraisal activities exploring the impact of the flood in Wanzhuang highlighted the use of fast growing legumes in the period immediately after the flood event. These crops were utilised due to their relatively short maturation period of approximately two months permitting the villagers to plant and harvest in the foreshortened summer season to permit sowing of wheat in September. This finding contradicts the outputs of the questionnaire survey that indicates the majority of households did not use different crops⁶¹. The rural appraisal activities also revealed that the villagers changed the crops grown for personal consumption. Carrots and cabbages were planted as these could be harvested relatively quickly (between 70 and 90 days). The irrigation data for Wanzhuang show that a small, but sizeable minority

⁶¹ Based on my judgment I find the data drawn from the rural appraisal activity (and interviews) more plausible. During these activities I spent up to four hours with the participants discussing aspects of the flood and working together to build up a picture of the event. The questionnaire survey was administered through enumerators with limited understanding of the event itself. Furthermore, the respondents were asked to recall an event that occurred 6 years previously without the benefit of group discussions to aid recall.

(19 per cent) used more irrigation following the flood event. The use of additional irrigation by some households following the flood event could be linked to the increase in fertility of the soil and an attempt to increase yields by increasing the amount of water available for the crops and / or the reported slightly drier conditions the following year (20140203 Interview Wang Hong-Li).

5.3.2 Reducing outgoings and increasing income

Figure 5-7 shows the number of coping strategies adopted by households disaggregated by rural case study sites. Overall, the mean number of strategies adopted to cope with the drought in Dongdian (n=38) was 2.84 compared to 3.34 for Wanzhuang (n=35). The most noticeable aspect of the plot is the higher numbers of households in Dongdian reporting no coping strategies compared to Wanzhuang.

Figure 5-7: Number of reported coping strategies adopted by households in response to the 2011 drought in Dongdian and the 2007 flood in Wanzhuang.

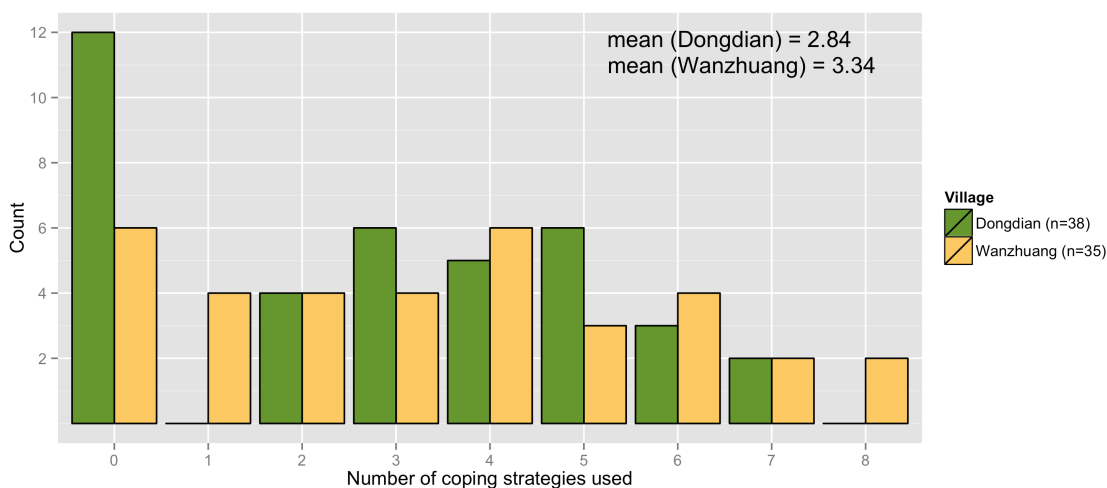
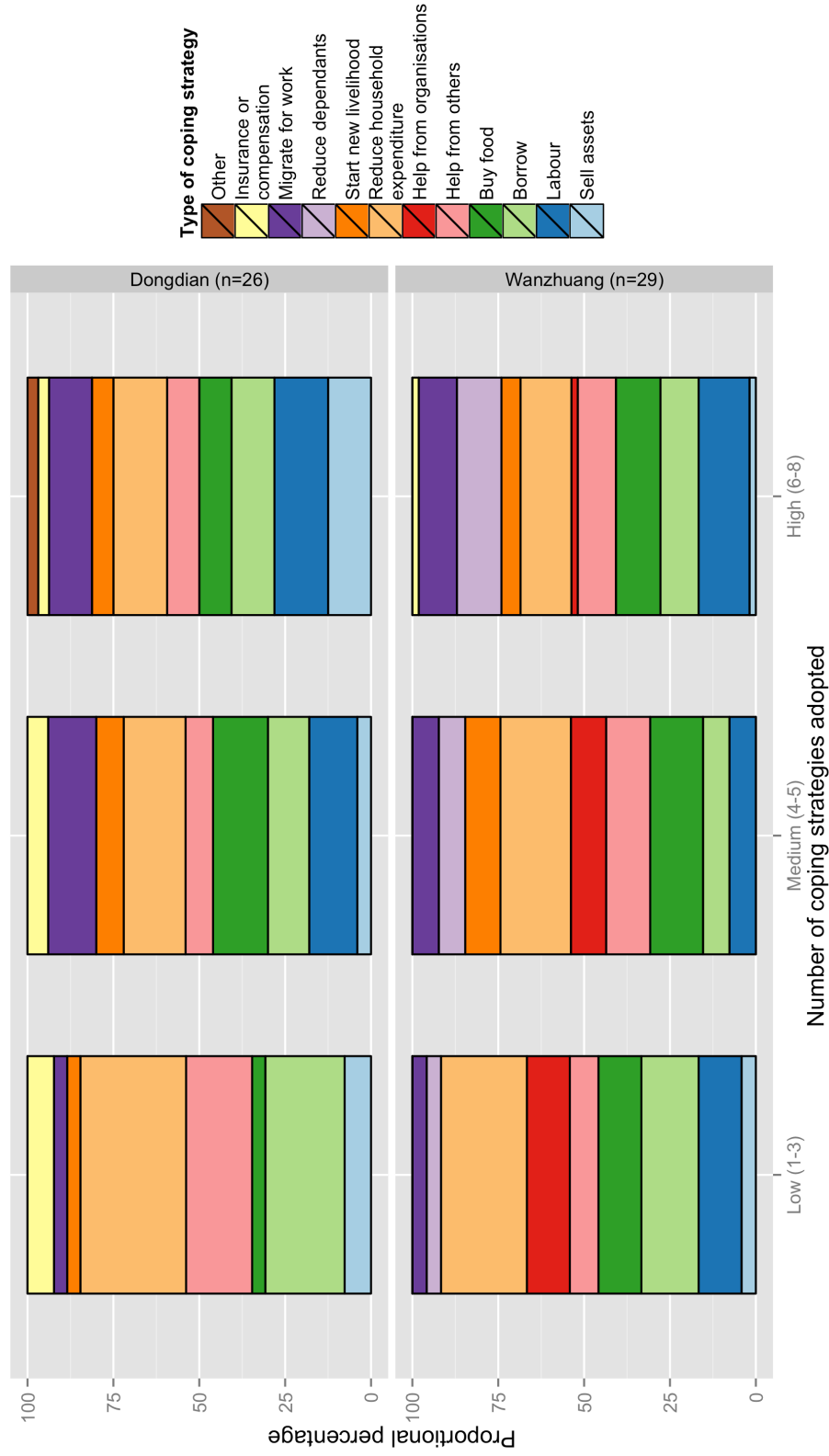


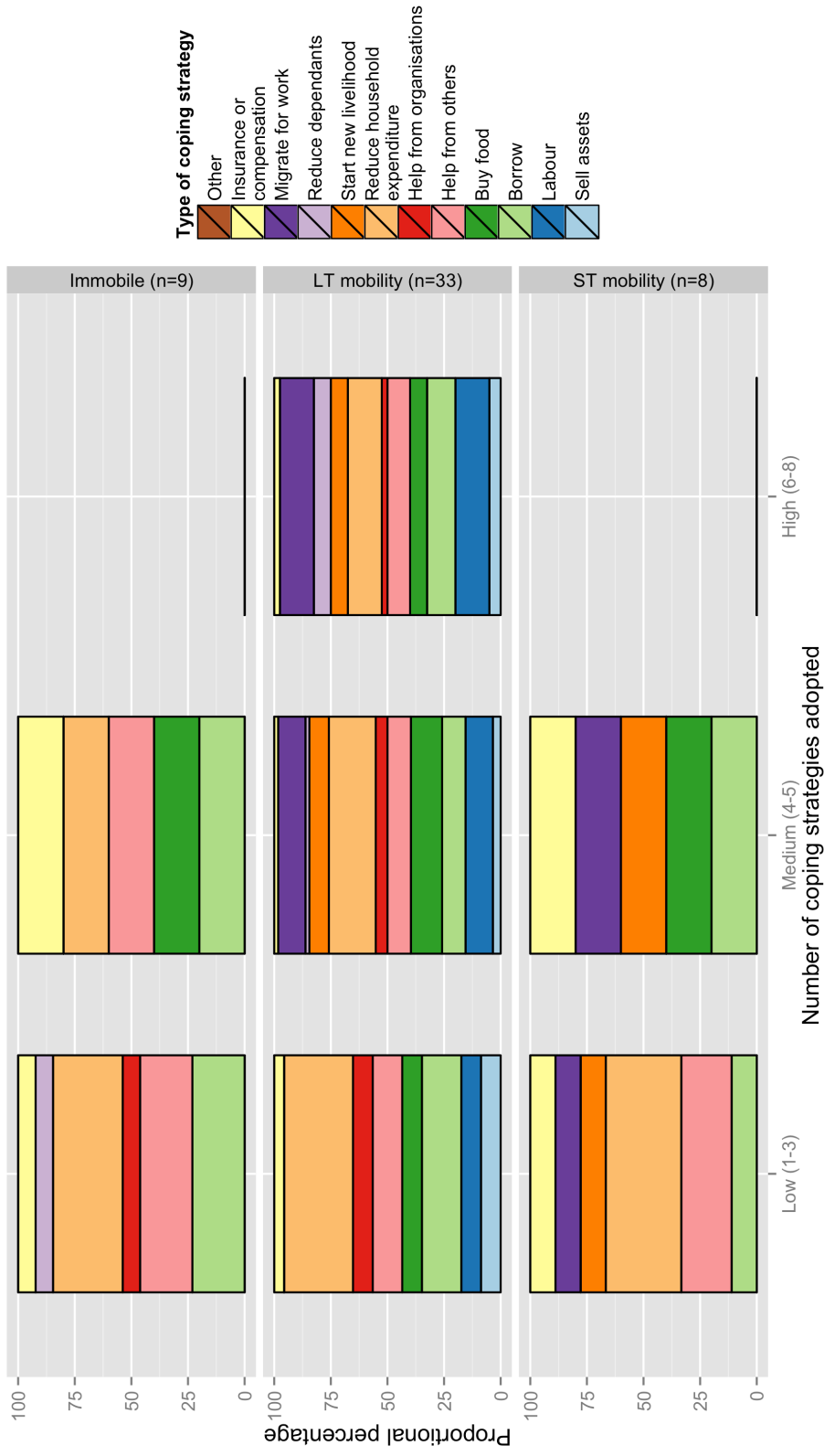
Figure 5-8 below shows the different types of coping strategies adopted disaggregated by the number of overall strategies utilised by households. The figure provides an indication of the preferences for specific coping strategies in relation to the overall number adopted. Figure 5-9 below presents the same data but disaggregated by mobility type to provide some insight into the types of behaviour adopted by the more and less mobile groups within the case study sites. For both figures, due to the disaggregation, the sample sizes are small, as such the data should be viewed in a more illustrative light rather than representatively.

Figure 5-8: Type of coping strategies adopted (excluding household that reported zero coping strategies) disaggregated by the number of coping strategies utilised per household for Dongdian (2011 drought) and Wanzhuang (2007 flood)*.



* Each bar represents proportions of the total count for that bar.

Figure 5-9: Type of coping strategies adopted (excluding household that reported zero coping strategies) disaggregated by the number of coping strategies utilised per household exhibiting different types of (im)mobility: Immobile, Shorter-term (ST) mobility and Longer-term (LT) mobility*



*Each bar represents proportions of the total count for that bar.

For Dongdian, Figure 5-8 shows that reducing household expenditure and borrowing money are the dominant strategies for those households adopting fewer coping strategies but also appear consistently for those households that have adopted a medium or high number of strategies. The universal presence of these strategies indicates they are the 'go to' behaviours to adopt when experiencing livelihood upheaval, supporting traditional views on responses to droughts (Corbett, 1988). Less clear-cut but becoming more visible as the number of coping strategies adopted increases selling one's labour and moving for work, suggesting that the drought acts as a trigger for some to pursue alternative income sources.

For Wanzhuang, Figure 5-8 shows that the main differences when compared to Dongdian is the presence of help from organisations and reducing the number of dependents that reside in the household. The increased visibility of external organisational support is likely to be a result of the specific disruptions associated with the flood the number of service providers were called upon to provide shelter, food, and medical care for the resident population when they were relocated. This highlights the importance of institutions in helping displaced populations cope during the initial disruption before they are able to return to their homes. Reducing the number of dependents in households only occurs in Wanzhuang and tends to be adopted in households using higher numbers of coping strategies. The practice of reducing the number of dependents within a household and its occurrence (only within those households reporting higher numbers of coping strategies) suggests that it is only put into practice if unavoidable.

Overall, for both sites, the picture is quite messy and emphasises the multiplicity of coping strategies and the assets that households draw upon (financial, physical, social and human) rather than an exclusive focus on one type (Hoddinott, 2006). Furthermore, the data seems to indicate that conventional notions concerning the logical progression in which strategies are adopted does not hold true in all cases (in an issue I return to in Section 5.4) (Devereux and Longhurst, 2010; Sabates-Wheeler *et al.*, 2008).

Disaggregating the data by mobility type (see Figure 5-9) shows a number of interesting features. The immobile group appear to rely extensively on behaviours (reducing expenditure, borrowing, and seeking help from organisations and people) that are locally implemented and with relatively little cost (in both monetary and non-monetary terms). The households with members absent through longer-term mobility utilise a number of strategies to reduce expenditure or boost income including labouring for others, migrating for work and reducing expenditure in addition to selling assets and starting new livelihood activities. Of these, selling assets, and labouring for

others are unique to the group of households with longer-term migrant members possibly indicating a constrained household economy that might be attributed to a lack of labour associated with adults of working age absent through migration. This group of households, with longer-term migrant members, use more coping strategies on average (3.7) compared with the shorter-term mobility group (1.9) and the immobile group (2.0) of households. Finally, the group practicing shorter-term mobility show a mix of measures that utilise local support structures and additional income boosting behaviours, possibly in other locations.

Cumulatively, the data suggest that the impacts of the environmental perturbations are clearly differentiated by type (flood or drought) and that the responses to these impacts vary between households. Exploring the impact of different types of (im)mobility on coping strategies, some differences are evident suggesting that households' mobility does play a role in mediating the impact of (in this case) environmental perturbations. Households that were using mobility at the time of the perturbation appear more likely to use mobility as part of their basket of responses. Furthermore, these households with more mobile members, also seem more likely to take up new livelihood activities, which could be related to increased opportunities (made accessible through migration) away from the affected location.

5.3.3 Longer term behaviour and planned adaptation

The psychological impact of the flooding extends beyond the impact of the events themselves and affects the behaviour of at risk households. The majority of households farm wheat in the winter and corn or soya in the summer. The rural appraisal activity concerning the impact of the drought highlighted that the choice of corn or soy is based to a large extent on the amount of rainfall or the perceived threat of drought. Corn fetches a lower price at market (1 RMB per jin⁶² for corn and 2.5 RMB per jin for soya) yet is more resistant to drought (20140206 Interview Pan Hong). The choice to plant corn rather than soy suggests that households perceive the threat from drought as significant and are taking steps to decrease their exposure by planting crop types that are more resistant and produce higher yields under water scarce conditions. The decision over which crop to plant demonstrates an awareness of the increasing risk of dry conditions (see section 5.2) and the implications this has on specific crops.

During the rural appraisal exercises and in informal conversations, residents of both sites reported selling their wheat crop as soon as it was harvested to avoid the worst excesses of any potential flood. For example, a resident from Dongdian stated that

⁶² A jin is a unit of weight and is equivalent to 500 grams.

crops were sometimes harvested before reaching maturation to ensure they were out of the ground and sold prior to the rains arriving (20140206 Interview Pan Yao). Similarly, a Wanzhuang resident reported fearing the impact of floods and the damage it can do (20140302 Interview Wang Hong-Li). During the appraisal activities in Dongdian, a participant gave the example of other villages in the locality that were on higher ground. The villagers in these villages were able to hold on to their crop until the price increased enabling them to generate more profit from their wheat yield (20130417 RRA7DD). This type of behaviour shows awareness of the environment and potential losses weighed against the costs of selling produce at sub-optimal times of the year. The price of wheat is at its lowest around the time of the harvest as supply is abundant.

In and around Wanzhuang attempts have been made to reduce or control the impact of flooding. The main east-west road on the north side of the village was heightened following a significant flood (this road acts as a levee to prevent water inundating the village) in the 1990s and concreted and heightened again more recently⁶³. The village funded this measure (at a cost of 60,000 RMB) through direct contributions from each household or by cutting down trees and using the wood for payment. Other recent measures include the widening of a drainage ditch to the east of the settlement area; paid for by the Zhan'gou town government (see Figure 5-10). The funding mechanisms employed to secure the developments in flood infrastructure represent a cashing in of long-term assets (wood) to decrease exposure at a community level to flooding (20130501 RRA3BWZ).

⁶³ The dates are a little uncertain but probably after the 2007 flood.

Figure 5-10: A recently widened drainage ditch in Wanzhuang.



In Dongdian a drainage system⁶⁴ is in place although its efficacy was questioned by key informants on a transect walk through the village and surrounding area (20140415 RRA3BDD). During the walk, the key informant stated that the drainage gate was too small and miss-located. The drainage gate is in the northeast corner of the farmland owned by the village. However, this is not the lowest point of the farmland (that is in a more easterly direction). This means that the drainage system fails quickly during heavy rains. The key informant indicated that the responsibility for the siting of the drainage gate did not rest with the village but was paid for and designed at the behest of a higher level of administration (town or county government for example). It is possible that the apparent error in locating the drainage gate is a result of a lack of consultation with locals and the imposition of inappropriate outside knowledge concerning local environmental conditions.

⁶⁴ The system was originally built in 1998 following a large flood.

Figure 5-11: A drainage gate to manage floodwaters in Dongdian.



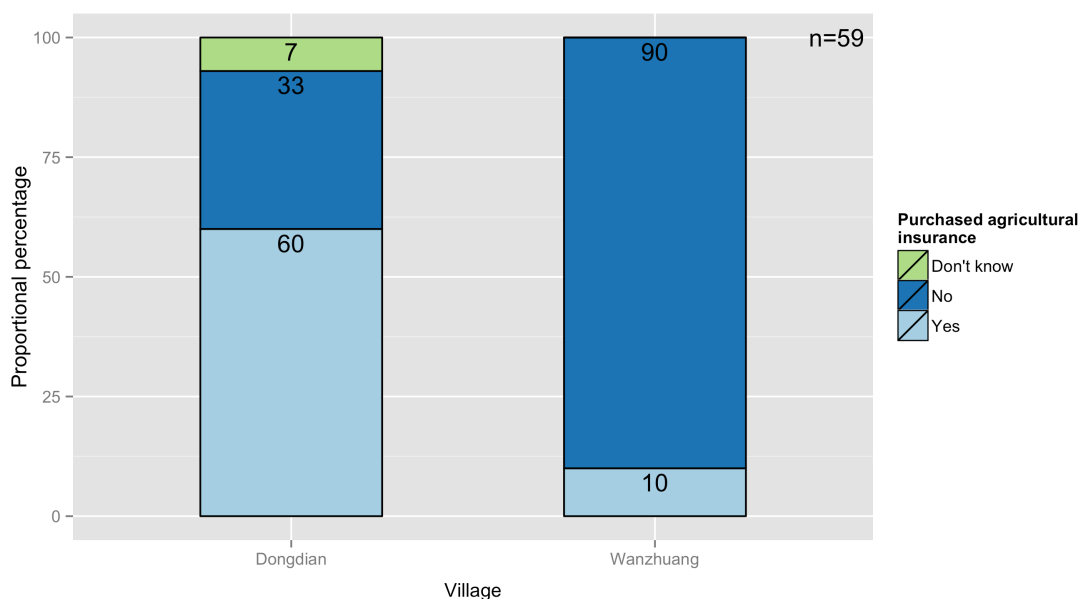
Both villages are in close proximity to the Feihe River. The villages are protected from the River by a levee that is approximately 24 meters in height (see Figure 5-12). A flood event in 2003 reached 23 meters a.s.l. and almost over topped the levee: as a result improvement works were undertaken in 2004 to heighten and widen the levee (20140204 Interview Wang Chung). Whilst providing protection against flooding from the Feihe, the measures have made it more difficult for the villages to extract water and irrigate farmland in times of drought. The impact, therefore, of increased flood protection has been to trade reduced exposure to flooding with increased exposure to drought and could be considered maladaptive in the long term (Adger *et al.*, 2003). The choice of development of flood infrastructure is especially interesting in light of both the biophysical data and perception of the changing nature of climatic perturbations. Analysis shows that droughts, in addition to floods, are likely to increase in the future (see Appendix 6) and, these twin threats, need to be addressed alongside each other rather than in opposition.

Figure 5-12: The levee protecting Dongdian from the FeiHe River.



Since early 2000s, China has been experimenting with various forms of agricultural insurance (Wang *et al.*, 2010; Yang *et al.*, 2007). In 2008, the Government in Anhui introduced a subsidy for field losses of up to 70 RMB per mu per harvest (depending on the estimated loss). To participate in the insurance scheme, households are required to make a payment of four RMB per mu per year. Should the insured farmer experience a loss of more than 30 per cent of his or her yield, the farmer is entitled to a 26 RMB payment. Figure 5-13 shows the take up of the agricultural insurance scheme for both case study sites. The production teams in Dongdian first purchased the insurance in 2012 on behalf of household members (the scheme had been operational for about four years at this point). The flood occurred prior to the introduction of the scheme and this timing has had a significant impact on the take up of insurance. In Dongdian (n=30 with eight excluded as incomplete), 60 per cent of respondents reported purchasing insurance where as only 10 per cent of respondents reported purchasing insurance in Wanzhuang (n=29 with six excluded as incomplete).

Figure 5-13: Reported take up of agricultural insurance by households for Dongdian (2011 drought) and Wanzhuang (2007 flood).



The planned adaptation behavior over the longer-term to mitigate risk as well as the more immediate response post perturbation highlights the importance of formal institutions and the perception of threats and exposures (in regards to frequency, severity and impact). The improvement of flood infrastructure, delivered through production teams within the villages, has reduced the exposure flooding. The government has also initiated an insurance scheme that villagers can buy into to help protect them against losses associated with environmental change. Evidence in the literature suggests that these measures should increase the perception of security from flooding and militate against risk averse behaviour (You, 2014). However, the insurance coverage is poor and, at a household level, flooding is still perceived as a very real threat that influences behavior (selling wheat at sub-optimal times or harvesting early). This sort of behaviour is considered in some circles as inefficient and not maximizing potential returns thereby reducing households' ability to accumulate assets in the long term (Carter *et al.*, 2007; Dercon and Christiaensen, 2011; You, 2014).

5.3.4 Mobility

A key behavioural necessity to the flood in Wanzhuang was short-term temporary relocation. Figure 5-14 shows the different types of mobility behaviour by village. The temporary relocation of Wanzhuang inhabitants required by the government is clearly visible. The other forms of mobility are much less clear-cut. Return mobility by family members to support those affected by the environmental perturbation is evident in a

minority of cases for both villages. This type of unplanned return mobility was practised for a variety of reasons that included support for those affected by the environmental perturbation. Follow up interviews provided greater insight into the timing and rationale for the return of family members. In Wanzhuang, the returnees attempted to time their return visit to correspond with the re-habitation of the village once the floodwaters had receded. The rationale for return was centred on helping those affected by the flood to recover. The following is an excerpt from an interview and is typical of the mind-set of returnees. Wang Zhou works in Shanghai and returned to Wanzhuang to help his elderly parents, who struggle with heavy manual tasks, recover from the flood. The reasons for the return are clearly evident.

Wang Zhou: Of course I had to come back; otherwise, no one will deal with the things at home?

RA: What did you do when back?

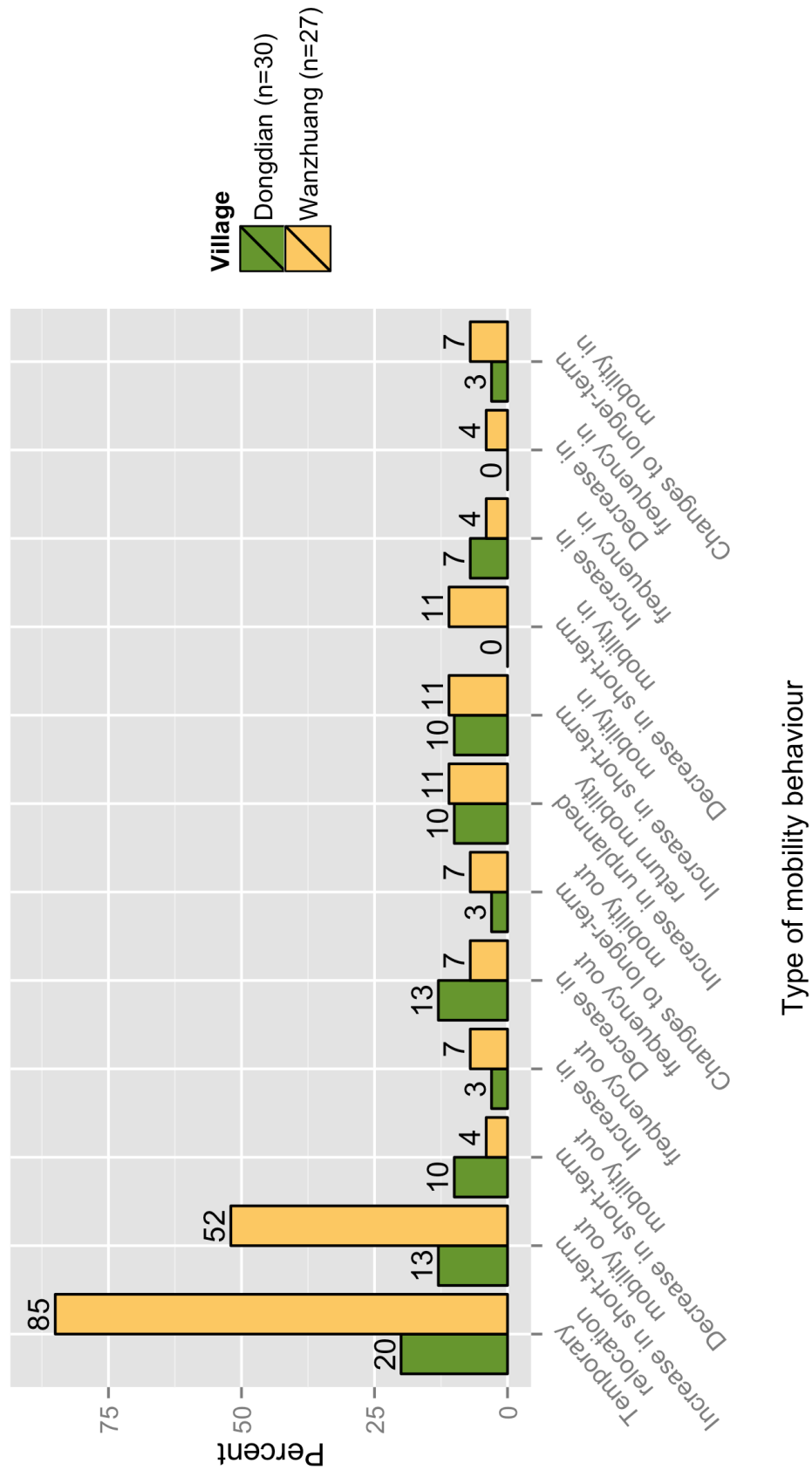
Wang Zhou: Moving things like the quilt, clothes, and the food.

RA: How long did you stay after you came back?

Wang Zhou: At last we waited the flood went down, moved all the things back, and cleaned the house to live in (20140203 Interview Wang Zhou).

Previously, I highlighted the example of certain households' inability to get their wheat harvest to market and subsequent losses associated with the flood (see section 5.2.1). The interview excerpt, above, demonstrates the continued importance that instrumental support plays for certain households in helping them to recover from (in this case, environmental) stresses or shocks.

Figure 5-14: Types of mobility employed during or as a response to the 2011 drought in Dongdian and the 2007 flood in Wanzhuang*.



*Y-axis represents the number of households as a percentage of the total number of households that reported mobility for each category of mobility.

In the majority of cases family members did not or were unable to return home to provide physical and emotional support. Although there will often be a desire for those working away from home to be close to family members who have experienced hardship and upheaval often it is simply not feasible, which can give rise to a range of negative emotions (such as sorrow and guilt). Two quotes from migrants working in Shanghai highlight some of the key issues preventing return during times of livelihood disruption and hardship for rural family members.

On no, I didn't have time. We are running business here so we can't be back
(20130713 Interview Pan Hao)

There were floods. The one in 2003 or so, was indeed rather big, which inundated everything in our house, as well as all the crops in the field. The government set up that kind of houses on the road for us to live in, then dispatched some stuff to us. The money earned through migrate-working was enough to cover the living costs, but we lost all the crops in the land. Thanks to the young people's migration, if they had all stayed at home we would have lost everything once the crops were gone (20130715 Interview Wang Meiyang).

The demands placed on migrant workers are stringent and often migrants simply cannot find time to return home or lack the job security to do so. Additionally, during times of hardship, income from remittances is often vital to help families cope. Interrupting work and endangering remittance payments effectively prevents migrants from returning home.

Another feature of the mobility patterns for residents of Wanzhuang was the high prevalence of short-term out migration in addition to the temporary relocation as a result of the flood. This type of mobility is most likely attributed to two main behavioural responses. Firstly, a minority of respondents sought to reduce the number of dependents residing with the household. In this instance families would seek to repatriate grandchildren to the child's birth parents where possible or other relatives. Secondly, a number of people used the opportunity to seek informal work elsewhere. The preceding analysis is supported through the rural appraisal activities exploring the impact of the flood. During the exercise the participants stated that some of the migrants (middle generation) returned to take their children back to the city with them. There was also some return migration once the flood had receded to help the older generation get back on their feet and repair damage to fields and infrastructure (such as roads).

The patterns of mobility in Dongdian are much messier and less clear cut, although they do raise some interesting questions. 18 per cent of respondents in Dongdian practised short-term temporary relocation as a result of the drought. This finding is unexpected as no immediate threat to life or assets occurred as a result of the drought. Follow up interviews and detailed analysis of other data sources yielded no light on this matter. Possible explanations include the potential that the movement patterns would have taken place regardless of the drought and the co-occurrence is coincidental (picking up 'background noise'). Alternatively, the information about people's mobility patterns was often provided through proxy-respondents who may not have had all of the information concerning the rationale and motivations for specific moves.

For both sites, the majority of people reported no change in their mobility behaviour as a result of the flood or drought (beyond that discussed above). This suggests that other measures were employed primarily to respond to the disruption caused by the environmental change and that mobility was either not a necessary (not obliged / forced) response, not selected as an appropriate response (not desired) or not available as household mobility was already at its limit (a suggestion also made by Findley, 1994, in explaining the absence of an increase during a drought).

Longer-term mobility

Looking at individual, longer-term mobility, 65 people from 39 households were reported as leaving within the 10-year reference period (26 people were excluded from the analysis as they left outside of the reference period)⁶⁵. Of these, 38 individuals (19 households) were from Wanzhuang and 27 individuals (20 households) were from Dongdian. Figure 5-15 shows the timing of the moves for these longer-term migrants in relation to the drought and flood (indicated by the red and blue shading respectively).

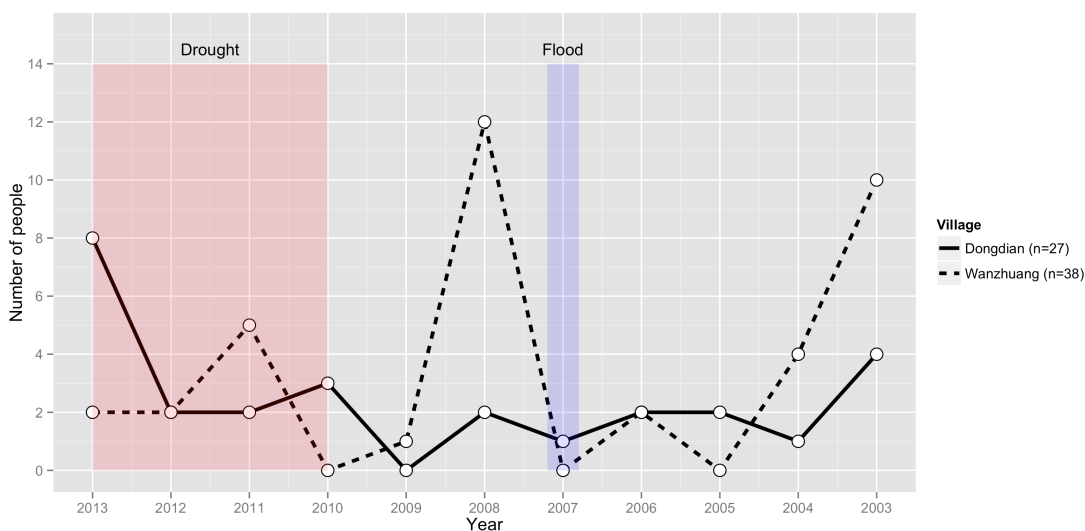
Across both sites there are two distinct peaks in 2008 and 2003 for Wanzhuang and in a smaller increase in 2013 in Dongdian. The more recent peak for Wanzhuang and the increase for Dongdian are proximate or covary with the periods of environmental change under study. For Wanzhuang, in the year immediately after the flood, 12 individuals from seven households were reported as leaving on a longer-term basis compared with zero in the preceding year and one in the following year. These data triangulate with additional analysis (see Figure 5-14) in which nine households reported changes in longer-term mobility (either an increase in in-migration or an increase in out-migration). In 2003, 10 individuals from six households left Wanzhuang. Information for this period was not sought in detail but biophysical data corroborated by

⁶⁵ Data drawn from the whole sample (n=97) and not just those households able to recall the environmental perturbation.

rural appraisal activities and interview data does provide a robust indication that a significant flood event occurred that impacted on both sites. The peak shown in the graph could be picking up the impact of this event.

Dongdian has experienced below average rainfall since September 2010 and this co-occurs with an increase in longer-term mobility in 2013. In 2013, eight individuals left from seven households compared to two in the previous two years. However, the peak in the data is not as pronounced as that for Wanzhuang and there is a danger of reading too much into the data bearing in mind the small sample sizes and the biophysical data showing that the below average levels of precipitation cannot be considered very extreme. In light of the above information, the most I would be confident in inferring from these data is that there has been a small increase in the volume of people leaving which may be due, in part to the drought like conditions affecting the agriculture.

Figure 5-15: Volume of individual out migration reported for the last 10 years by proxy respondents for Dongdian (drought in 2011) and Wanzhuang (flood in 2007)*.



*Note the reverse order of the x-axis (more contemporary years are closer to the y-axis).

5.3.5 Diversity of coping and adaptation employed

Across both case study sites households have implemented a number of strategies to respond to the challenges presented by flooding and drought. These include changing agricultural practices in the form of irrigation, the application of pesticide and fertiliser and the use of more seeds to counteract the increasing mortality of crops associated with climatically stressed agricultural systems (see Vincent *et al.*, 2013 for similar examples of adaptation by farmers in other contexts). The agricultural strategies

implemented by the households demonstrate a farming system well adapted to the sorts of perturbations analysed for this research (Helgeson *et al.*, 2013).

Specific coping strategies were implemented in both sites after the environmental perturbation and appear to be structured in such a way that the measures that were easiest or had less cost (in both monetary and non-monetary terms) to implement were put into practice first (reducing expenditure and utilising networks to borrow). Once these measures were exhausted, measures that engendered more cost or greater disruption were adopted, such as selling of assets (in the case of Dongdian) or reducing dependents (in the case of Wanzhuang). The presence of specific adaptation measures for each site suggests that certain strategies may be better suited to the specific conditions engendered by the perturbation in question. Further, the analysis also suggests that there may be some measures (such as starting a new livelihood activity) that can be encouraged as a likely contributory factor to increased resilience and development rather than just behaviour as coping response (Tanner and Horn-Phathanothai, 2014).

Disaggregating the data by mobility types showed the more immobile tended to rely on their local networks and social capital whereas historically mobile households used migration as a coping mechanism in addition to taking up additional livelihood options. These data suggest that socially differentiated households call upon a different range of assets depending on those they have the most legitimate and effective command over. For households with greater mobility endowments and entitlements, options associated with these are utilised whereas those lacking mobility endowments and entitlements call upon other asset sources over which they exercise greater command (various social endowments and entitlements for example). These insights support the work of scholars that assert coping responses draw on a multiplicity of assets available to individuals and households rather than just one type (Hoddinott, 2006)

Shorter-term mobility was a key response utilised by the majority of households in Wanzhuang and a minority of households in Dongdian. Similarly, a minority of households reported that family members returned to help cope with the impacts of the climatic perturbation. The use of return migration suggests that, for certain households, physical and emotional support is required as opposed to solely financial support to help the affected individuals get back on their feet. Within the case study sites and in the interviews with migrant household members the expectation that this support would be forthcoming is questionable. Migrants highlighted the more active role of the state (20130712 Interview Pan Hao) in recent years and some rural household members

indicated that they would be reticent about contacting absent members to request help (20140204 Interview Wang Dewei).

Perceptions of risk and exposure were important and influenced behaviour. In both villages, it was reported that crops were harvested early or sold at sub-optimal times owing to the fear of flooding. Similarly, a number of engineered measures have been implemented in recent years to cope with the impacts of flooding specifically, in spite of the evidence that droughts will also become more prevalent in the future. The efforts to protect the villages from the FeiHe River (when in spate) have decreased the ability of villagers to extract water from it for irrigation and could be considered maladaptive in a drought context (Adger *et al.*, 2009b; Barnett and O'Neill, 2010). These decisions show that increased resilience to flooding has been traded against decreased resilience to droughts.

5.4 Relationship between climatically driven environmental change and mobility

In this section I discuss the interaction of the climatically driven environmental perturbation, institutions that impact upon mobility and mobility endowments and mobility entitlements. Firstly, I show that differing levels of mobility for individuals within households appear to influence the choice of coping strategies adopted. Secondly, I highlight the importance of remittances and formal institutions in influencing the perceived levels of support required by households in the villages. Finally, I discuss the importance of the interactions between social processes or institutions, for example in determining differing levels of resilience.

5.4.1 Use of mobility by households reporting different lengths of time to recover financially

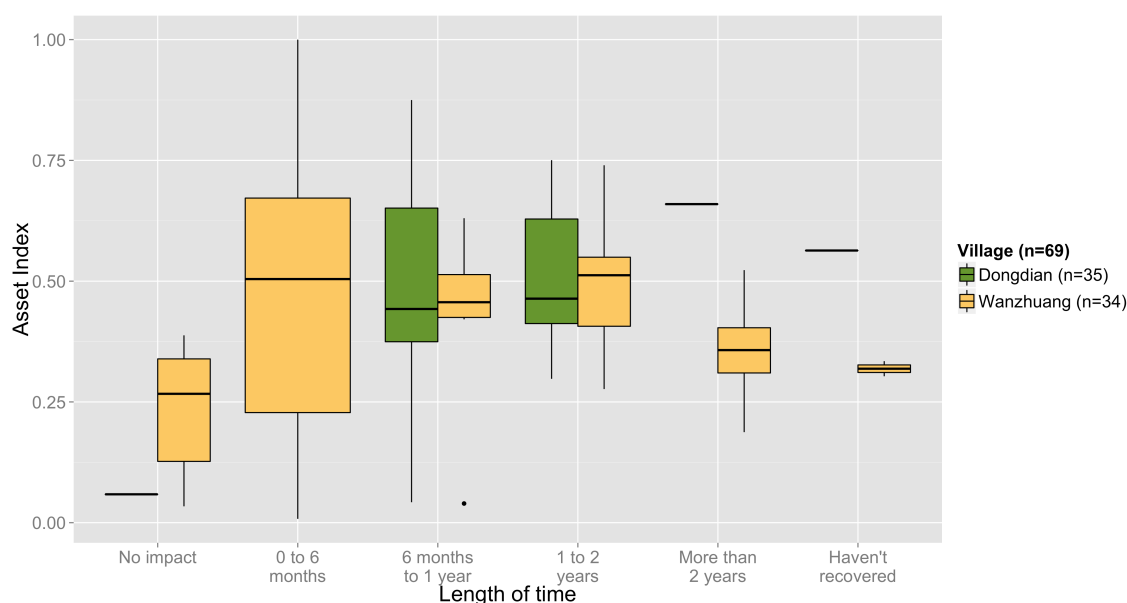
The amount of time taken to recover financially from the climatic perturbation provides a useful measure to assess the impact of the climatic perturbation and also generate insight into the ability of households to cope and adapt (discussed earlier in section 5.2.2). Through an asset index (for description of asset index methodology and scores see Appendix 3), the relationship between wealth and financial recovery time can be compared (see Figure 5-3 and Figure 5-16). Table 5-3 shows the mean asset scores of the households reporting different categories of financial impact by village and aggregated for both sites.

Table 5-3: Mean asset index (AI) scores of households disaggregated by village and the time taken to recover financially from the flood or drought.

		No impact	0 to six months	6 months to 1 year	1 to 2 years	More than 2 years	Not yet recovered
Dongdian	Mean AI	NA	NA	0.49	0.51	0.66	0.56
	N	1	0	24	8	1	1
Wanzhuang	Mean AI	0.23	0.48	0.43	0.50	0.36	0.32
	N	6	9	7	6	4	2
Both sites	Mean AI	0.21	0.48	0.47	0.50	0.42	0.40
	N	7	9	31	14	5	3

Figure 5-16 shows the mean, interquartile range and total range for each category of financial recovery. The figure shows that, as the amount of time taken to recover from the flood or drought increases, so the standard deviation decreases, as does the range from the maximum to minimum values⁶⁶. In other words, households that reported taking longer to recover were located more closely together on the asset index. This finding is reflected in the mean asset score, which does not vary much between the zero and six-month group up to the one to two year group. Only at the immediate and longest recovery times does the mean asset index score decrease, suggestive of a quadratic trend (the extreme values are populated predominantly by households from Wanzhuang rather than Dongdian) (see Table 5-3 above).

Figure 5-16: Household asset score plotted against time taken to recover financially from the flood or drought.



⁶⁶ Excluding one low scoring outlier for Wanzhuang in the category '6 months to 1 year'.

Households that reported no financial impact had a very low score on the asset index indicating that the group was the poorest in the village. Welch's F test⁶⁷ was used to analyse mean variance and found to be significant $F(6, 11.31) = 5.87, p < .01$. The low asset index score of the households reporting no financial effect is counter-intuitive, as one would expect those households, at the poorer end of the spectrum to take a longer time to recover. This issue has been discussed previously in section 5.2.2 and it is possible that financial impact for poorer households (more reliant of state support) is perceived differently (they adapt their preferences), thus explaining the low- and high-end figures.

Figure 5-17 plots the groups of households reporting different lengths of time to recover financially against different behavioural responses disaggregated by mobility type (mobile and immobile). The top plot in the figure looks at both sites cumulatively and the bottom two plots address the mobile and immobile groups respectively. The time taken to recover financially includes three groups (represented by the red and orange dotted lines and the blue continuous line) where the sample sizes are very small: $n=3$ for no reported impact, $n=4$ for more than two years to recover, and $n=6$ for a recovery time between zero and six months. Disaggregating these groups across two types of mobility further reduces the number of cases in each group. As a result of the disaggregation and the resulting small numbers of observations in each of the aforementioned groups they are excluded from the following discussion.

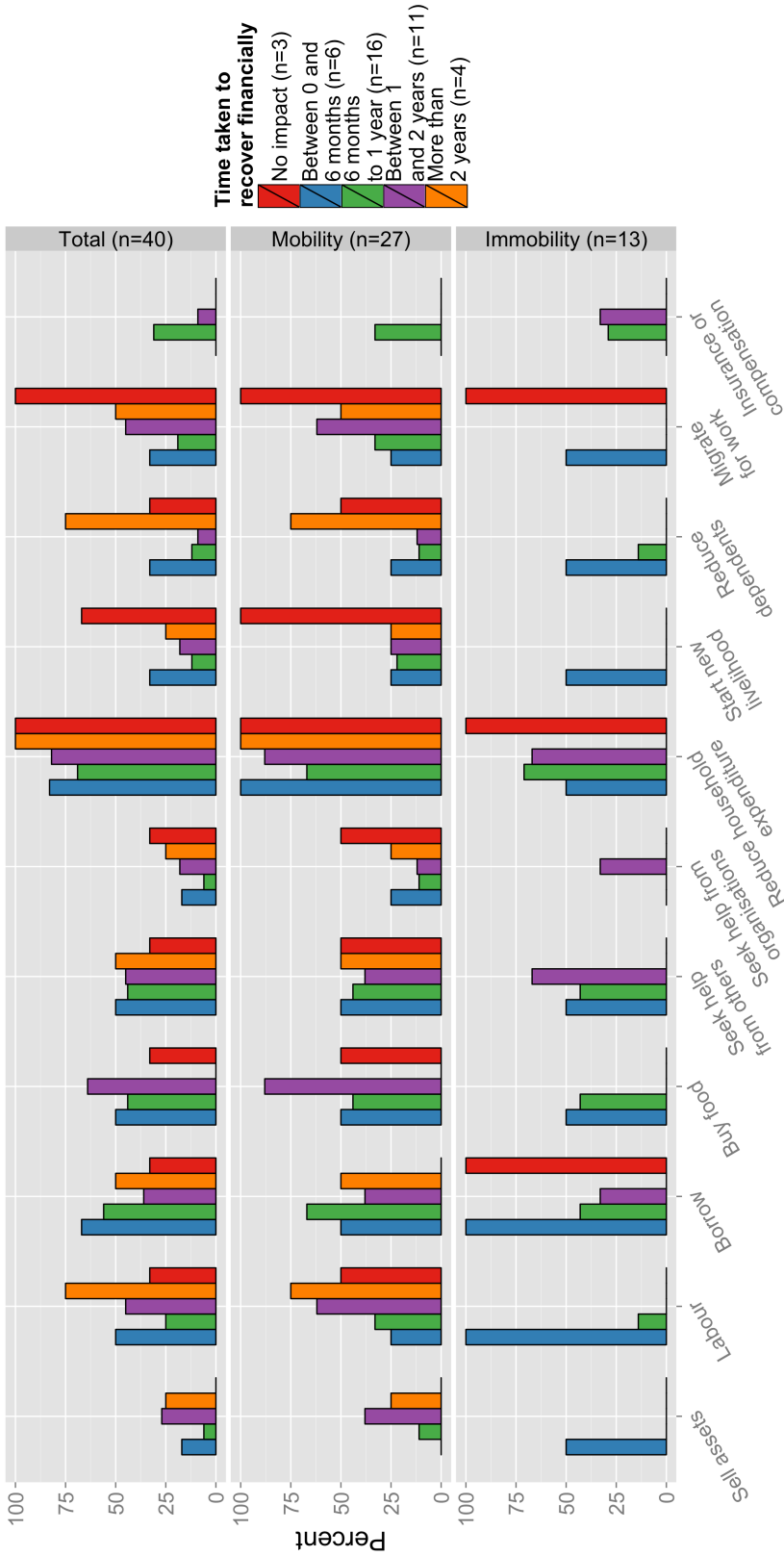
Broadly, the lines representing financial recovery of between six months and one year (green dashed line) and between one and two years (purple dot dashed line) track each other on the plots when comparing the mobile and immobile group. However, for certain coping responses there is difference suggesting that mobility does affect the type of measures adopted. The more mobile groups appear more likely to sell assets, buy food, labour for others, start a new livelihood and migrate for work compared to the immobile group. These data point to the importance of being able to be mobile (to have an effective command over one's mobility entitlements) in mediating the impact of (in this case) environmental perturbations for certain social groups (supporting analysis in Section 5.3.2).

Selling of assets is a behaviour that was not adopted by the immobile households whereas the mobile households did show more inclination to sell assets. Asset selling is widely considered in the literature to be a serious impediment to household recovery

⁶⁷ The mean scores for each period of time taken to recover were subjected to statistical analysis to assess for normality and homogeneity of variance. Levene's test was significant, $F(5, 63) = 2.52, p = .03$ indicating that the assumption of homogeneity of variance has been violated so a non-parametric test was used.

in the long-term (Dercon and Christiaensen, 2011; Devereux and Longhurst, 2010). Although care needs to be taken owing to the small sample sizes used in this analysis, the behaviours of the more mobile group questions the assumptions concerning the impact of asset selling. In this instance, asset selling appears to form part of a strategy to boost income in the short term but does not impact significantly on the length of recovery (comparing the mobile and immobile groups). Greater access to credit and liquidity engendered by participation (through mobility) in labour markets could help those household recover from the sale of assets. Despite the different approaches adopted, the mobile and immobile groups reported taking the same amount of time to recover financially suggesting that there are many combinations of responses that enable households to cope with livelihood perturbations.

Fig 5-17: Behavioural response to the climatic perturbation plotted against households reporting different lengths of time to recover financially from the climatic perturbation disaggregated by reported mobility behaviour*.



Type of coping strategy adopted

*Mobile group includes all households within the sample that reported members as undertaking long-term or short-term migration with the reference periods. The immobile group includes all households within the sample that reported members undertaking no long-term or short-term migration within the reference period and those reporting no migration at any point.

5.4.2 Remittances, government support and changing patterns of family organisation

Remittances are a key means through which families can boost or maintain incomes in times of livelihood disruption. Data from the questionnaire (Table 5-4) show that 56 per cent of households received remittances in the sample population across the two case study sites, highlighting the importance of remittances as an income source. In both sites, between a half and two thirds of families that received remittances at the time of the survey also received remittances during the flood or drought. The differing levels of receipt of remittances reported during the environmental perturbations are most likely associated with recall issues associated with timing of events in relation to the survey. The flooding in Wanzhuang occurred in 2007 and the survey took place in 2013 compared to the drought in Dongdian, for which 2011 was the year of interest.

Table 5-4: Receipt of remittances by households at different time points for Dongdian (2011 drought) and Wanzhaung (2007 flood).

	Dongdian n=38	Wanzhuang n=35
Currently in receipt of remittances of which:	16	17
during the perturbation	(69)	(53)
not during the perturbation	(31)	(41)
doesn't know about remittances during the perturbation	(0)	(6)
Not currently in receipt of remittances but was previously of which:	4	4
during the perturbation	(25)	(50)
not during the perturbation	(50)	(50)
doesn't know about remittances during the perturbation	(25)	(0)
Not currently in receipt of remittances and previous behaviour unknown	0	1
Never received remittances	9	7
Remittance behaviour unknown	9	6

Figures in parenthesis in per cent

The importance of remittances is borne out through analysis of the qualitative interviews. Wang Bao-Zhi is 59 years old and married with four children (three girls and one boy). In recounting the flooding that has affected Wanzhuang, he described three events in 1991, 2003 and 2007. Wang Bao-Zhi felt that the impacts of the 2007 flood were not as severe compared to the other floods, part of the explanation for this was because he no longer needed to look after his children (they had left home) and they were able to remit money back to him. During the floods of 1991 and 2003 he had children who were living at home and going to school and were thus not able to contribute to the household economy but did place demands on it (20140203 Interview Wang Bao-Zhi).

Pan Hua provided another example of remittances being used to mitigate the impacts of, in this case, the drought. Pan Hua was married and her husband works away from the village. During the interview Pan Hua talked about the remittances that she receives. Overall, she felt that her children (two sons and one daughter all aged in their twenties) had to leave because there isn't enough land for the whole family to farm. As a result of the children working away along with her husband, life is now a little better. Pan Hua felt that if all of her family had stayed in the village they would only have had enough income to eat and subsist where as the standard of living is slightly higher as a result of the family members migrating. During the drought, Pan Hua received additional support from her family, which helped her make up for the shortfall in income due to the reduced yield (20140205 Interview Pan Hua).

An interview with a migrant worker in Shanghai provides a view on remittances from the perspective of a migrant. Interestingly, this last example also brings to the fore issues associated with increasingly dispersed generations within households. Although not in relation to the flood, Wang Dao provided money for his parents to help secure additional labour to farm their land. His parents use this labour to help manage with the more physically demanding tasks. Wang Dao stated that you couldn't earn a lot from farming and it makes more sense for him to provide money rather than to return in person to provide labour and interrupt his wage. This account encapsulates the broader shift away from multigenerational households and the sharing of labour and resources to a new form of household arrangement that is characterised by dispersed generations providing monetary support in place of support delivered in person (20130713 Interview Wang Dao).

The interviews also revealed the changing nature of the state in helping communities recover from climatic perturbations such as floods and droughts. For example, Wang Dewei, in recounting his recovery from the flood stated that, although they mainly depend on themselves, the government did provide some assistance to ensure that they did not fall below a certain minimum standard of welfare. Wang Dewei went on to say that the government support was mainly in the form of food aid (rice and wheat) and it does not enable them to improve the basic aspects of their lives such as the quality of their housing. To highlight his point, Wang Dewei pointed out the damage that had been caused to his house by the flood in 2007 and he could still not afford to repair. Furthermore, Wang Dewei emphasised that he also received remittances from his daughters (totalling around 700 RMB per year) as he could not afford just to live on the government support alone (20140204 Interview Wang Dewei).

The role of the government in supporting communities to recover from the effects of a climatically driven environmental change appears to have been a factor influencing the decision-making processes of one of migrant workers. One interviewee in Shanghai, when asked whether he would return during a flood or drought, stated, '[n]o, no time, for the flood, the government had plans, we were just all in Shanghai' (20130712 Interview Wang Dao).

This quote highlights the prominence of the government as a factor in the decision-making processes that migrants go through in deciding when and if they need to return home. As with the example previously, the role of government appears to have evolved and reflects the changing socio-political conditions and the general move away from collectivised responses to events in the past. Regardless of the changing nature of the role that government played in supporting the residents of Wanzhuang to cope with the impacts of the flood and, to a lesser extent, the residents of Dongdian to cope with the drought, it was considered inadequate. For example, Wang Dao felt that the government provided some support during the flood but it could have done more. Similarly, Pan Lijuan reports that the money they received from the government to help mitigate the impacts of the drought wasn't enough and they needed to go outside to work for a short amount of time (20140205 Interview Pan Lijuan).

Bringing these strands together, a picture of an evolving society emerges that is reconfiguring to adapt to the changing patterns of work and family organisation. In the case study sites the number of families with absent children is very high in a clear break from 20 or 30 years ago when the notion of split households was something that only a few would practice. As this feature of Chinese society has emerged and become more ingrained so the means through which household members support each other has changed to accommodate this new pattern of habitation. Remittances and the role of the government support are increasingly prominent in supporting family members that remain in rural locations during shocks and stresses.

5.4.3 Interaction of multiple institutional factors produces variations in resilience

The analysis above has highlighted a number of ways in which mobility has been utilised by households in response to the flood or drought. Although not addressed explicitly, the analysis is set within an incredibly complex and evolving web of circumstances that come together at specific points in time to shape individuals' and households' resilience of which mobility is a contributory factor.

The account of Wang Zhou is a case in point. Wang Zhou is 48 years old, married and has two children (aged in their mid-twenties). Whilst their children were growing up, Wang Zhou and his wife worked and lived in Shanghai whilst their children remained in Wanzhuang with Wang Zhou's parents. In 2013, Wang Zhou's father became ill and Wang Zhou and his wife had to return to Wanzhuang to care for him, giving up their jobs in the process. Wang Zhou has started farming again but the impact of a change in jobs has had an impact on the household economy. Wang Zhou stated that his father used to farm and he used to work in Shanghai: stretching the household and boosting the livelihood options available to the family increasing their earning potential. Wang Zhou's father farmed the family land and produced enough to subsist on. These activities also ensured that the family maintained a claim on their land and ensured that they were included in the New Village Redesign project should it go ahead. Wang Zhou and his wife worked in factory jobs in Shanghai and took advantage of the booming economy, earning considerably more than would have been possible in Wanzhuang. The benefits of this type of household arrangement are reflected in the asset index score of 0.56 for the household that is above the mean of 0.40 for the village) and the landholding of 10.7 mu, again above the average for the village (mean of 8.4 mu).

Since Wang Zhou's father became ill it has become more difficult for the household as they make less money and have greater outgoings. For example, Wang Zhou reported that they had to borrow money to fund the cost of an operation, as the state would only contribute a small amount to the medical costs. Repaying this money was entirely dependent on the income generated through farming.

We are not sure. In more than one year, if there is something wrong, we can only go home for getting in the crops, and we can pay it off if we have money left. But if we don't have money left, it will cost another year (20140203 Interview Wang Zhou).

Wang Zhou's father's illness has curtailed his ability to work (reducing the amount of labour available to the household) and increased the demands on the other adult members of the household who have to care for him. In addition to his father, Wang Zhou is also responsible for bringing up two grandchildren who live with him in Wanzhuang. Wang Zhou's house was damaged in the flood in 2007 and the moratorium on new building and renovations has meant that the house has yet to be repaired. The poor state of repair that the house is in has resulted in it being classed as 'dangerous to live'⁶⁸. Wang Zhou stated that should another flood occur the family

⁶⁸ Category of building condition (the closest equivalent in the UK would be 'unsafe').

would be heavily damaged and the cost of rebuilding would have to be met through loans and borrowing as they have no money to fund such measures.

The confluence of these factors on Wang Zhou's life make him much more vulnerable to future environmental perturbations (such as a flood), a point that he himself acknowledged during the interview. The account of Wang Zhou highlights the interaction of household institutions (its organisation), social norms and expectations (filial piety, *bao* and *xiao*) that placed an obligation on Wang Zhou to return to care for his father and the wider societal changes occurring in China. Cumulatively, these personal circumstances and institutional factors and broader changes in China (increased mobility, growing urban rural wage differences) obliged Wang Zhou to use his mobility endowments and deploy his mobility entitlement to return to his village to care for his father. However, Wang Zhou and his family now appear more immobile and are less resilient to future shocks and stresses (20140203 Interview Wang Zhou).

This type of situation was encountered quite frequently in my interviews with villagers and migrants. For example, Pan Hao reported that an illness to his brother effectively trapped his parents in Dongdian, '[m]y parents have to take care of my brother ... they can't leave. [RA: Yeah, right] If my brother wasn't sick we would be all in Shanghai. We would have shelter and food, right?' (20130712 Interview Pan Hao). The impact of the illness increases the pressure on the carers as they have an additional household member to look after and less labour available to meet the costs associated with caring for that person. The impact of poor health on a household in this example has decreased the mobility entitlements of the parents and son who is unwell: they are unable to leave the village and are subsequently more exposed to climatic perturbations. The issue of poor health and the dependencies it creates was also an issue touched on by Wang Dao who felt that families with a member who was not well would be less able to migrate than families who were healthy (20130713 Interview Wang Dao).

The experience Pan Hua provides an interesting counterpoint to the account of Wang Zhou and Pan Hao above. Pan Hua lives alone in Dongdian, her husband works away and she has three children (two sons and one daughter) who have grown up and live elsewhere. Pan Hua's husband has been splitting his time between the village and waged labour outside since 1996. During the busy agricultural seasons Pan Hua's husband would work in the village to bring in the harvest and sow the fields. Conversely, during the fallow periods, he would work away earning in the informal economy. The use of the mobility entitlements by four out of the five immediate family members has provided some improvements for the household and Pan Hua

specifically. For example, Pan Hua's son states that, 'I was in poverty until I was 14 and my life is about equal now [compared to other households in the village]'. The age of 14 is significant here as that is the point at which Pan Hua's son left school and went outside to work and provides a clear acknowledgement of the importance of migration in the improvement in his life.

Despite the use of mobility endowments to bring about an improvement in the lives of individual family members (such as Pan Hua's son), Pan Hua is not in a strong position financially. She stated that, although their conditions have improved over the last 20 or 30 years, life is still difficult and there is not enough money to get the house repaired for example. The economic status of the household is reflected in its asset score of 0.22 (this is substantially below the mean for the village of 0.49). Pan Hua felt that the 6.5 mu of land she farmed (village average is 8.9 mu) was not enough for her to live on but she did not have any other options⁶⁹. Working and living in a big city like Shanghai was not practical as the rent and food costs were very expensive. Furthermore, Pan Hua thought that her options for employment in urban areas were severely constrained owing to her lack of education and age. Pan Hua also stated that migration is something for the younger generation and her husband to undertake revealing a specific view of migration (for the young and predominantly male population) and how she makes sense of her circumstances. Pan Hua felt that her place was here in the village, maintaining the family land and home.

In terms of the resilience of the household as a whole, the dispersed lives of the individual members will help to insulate Pan Hua from any losses associated with climatic variability or perturbations. Similarly, the insurance that Pan Hua provides the other household members in maintaining the family home and land are crucial in enabling the absent members to pursue livelihoods elsewhere. However, the account of Pan Hua also highlights the obligation on her (specifically) to remain even though she feels that her life is difficult and the amount of land she farmed was not appropriate for her needs. This is an example of the gendered nature of the household as a decision-making unit and the expectation on specific individuals to fulfil certain roles (determined to a great extent by societal norms). During the interview, I also got the impression that Pan Hua's personal horizons did not extend much beyond the village. This suggests that there are psychological boundaries to people's habitable spaces and life beyond those limits is often not countenanced except *in extremis*. Viewed together, the institutional forces and psychological boundaries coalesce on Pan Hua to

⁶⁹ In the interview Pan Hua reported that she farmed 5 mu, this contradicted her questionnaire survey response in which she stated she farmed 6.5 mu.

reduce her mobility and make her the most vulnerable member within the household to climatic perturbations (20140205 Interview Pan Hua).

5.4.4 Discrimination in the type of adaptation options employed and the relationship with mobility

Exploring the data through groups of more mobile and immobile households reveals between group discrimination in the selection of certain coping strategies. The more mobile households seem to favour responses that are made accessible by mobility. This analysis suggests that household members with greater mobility endowments and entitlements are more likely to use these when faced with, in this case, an environmental perturbation. The corollary, that households with less mobility endowments and entitlements do not have these options available to them and rely on a different suite of coping strategies, is also borne out. The environmental perturbations under study in this research are not outside of normal bounds, so, although it would be extremely interesting, it is not possible to analyse whether these relationships between historic mobility and coping strategies persist in more extreme circumstances.

Analysis of questionnaire data concerning the impact on household finances, show that those with the lowest asset index scores either reported little or no financial impact or a substantial amount of impact that took more than two years to recover from. The counter-intuitive findings highlight that terms such as financial impact and financial recovery (see section 5.2.2) should not be used uncritically. In attempting to understand the picture painted by the analysis, a number of more subjective issues come to the fore. First, it is possible that poorer households have interpreted financial impact narrowly (only income derived from the state or remittances), which explains the presence of a number of 'no impact' responses. Second, households may also adapt down their preferences to cope with their predicament; in other words if you have nothing then you have nothing to lose as you are already at rock bottom. This process of preference adaptation may be partly responsible in explaining why a certain number of households report taking a considerable length of time to recover financially if at all.

Lastly, theory on poverty traps and ratchet effects indicates households affected by environmental perturbations (particularly droughts) tend to follow a logical path when adopting coping strategies. Furthermore, the selling of assets is widely considered to be a significant decision with the potential to impact on the long-term wellbeing of the household. Although the sample sizes are small, the analysis from this research suggests that asset selling specifically and the choice of coping strategies more generally needs to be understood more critically. For the households in the survey,

asset selling was performed by a minority but it did not seem to significantly alter the length of time it took them to recover financially. Overall this suggests that, in certain circumstances, asset selling does not have the negative effects generally asserted in the literature.

5.5 Conclusion

In this chapter I have shown that the impacts of the two different climatically driven environmental hazards have been experienced differently within and between the two case study sites. The impact of the flood has affected more aspects of people's lives whilst the drought's impact has mainly been restricted to agriculture and associated knock-on effects. The analysis shows that households within the case study sites practice a range of strategies to minimize disruption and spread risk (Paavola, 2008). Examples of these strategies include changing agricultural practices, boosting incomes and reducing expenditure. Longer-term adaptations have also been implemented to decrease the exposure to floods. Mobility was a feature of the coping behaviours although the picture was messy and complicated. Coping mobility was employed predominantly in Wanzhuang and there was also some increase in the numbers of people leaving on a longer-term basis although this cannot be directly attributed to the environmental perturbations. Similarly, some households used mobility to access income-generating activities or reduce the burden on the household economy by reducing the number of dependents.

Specifically, the analysis suggested that liquidating some assets did not have a significant long-term affect on households. Common understandings of household responses suggests that households adopt different strategies in a logical order culminating in more irreversible measures that have long-term impacts on the households wellbeing (Corbett, 1988; Dercon and Christiaensen, 2011; Devereux and Longhurst, 2010; Skoufias, 2003). The analysis also showed that households that contain members who are or have been mobile tend to use mobility to access a different portfolio of coping and adaptation strategies compared to households that are more immobile. The option of mobility-related coping behaviours suggests that the more mobile group of households may have a wider basket of coping measures available to them compared to the non-mobile households perhaps increasing their ability to cope and represents an interesting avenue for further enquiry (especially under conditions that are more extreme and outside of normal bounds). Furthermore, different suites of coping strategies were adopted by different groups of households yet the reported time taken to recover was similar suggesting that coping strategies may be more idiosyncratic than previously suggested (Helgeson *et al.*, 2013).

The perception of exposure and severity of the environmental perturbations was also an interesting feature of the analysis. Some behaviour, particularly in the longer-term, could be considered maladaptative⁷⁰ (enhancing flood protection but increasing exposure to drought). Risk averse behaviour was also in evident in spite of the presence of insurance against potential losses suggesting that the insurance market is not yet developed enough to influence behaviour and encourage asset accumulation (You, 2014). Interview data suggests that, in certain circumstances, financial impact could be understood in very narrow terms and helps to explain the some of the variation in the data. These insights highlight the importance of considering the meaning of specific terms (such as 'financial impact' or 'financial recovery') within different settings and contexts.

⁷⁰ Defined as 'action taken ostensibly to avoid or reduce vulnerability to climate change that impacts adversely on, or increases the vulnerability of other systems, sectors or social groups' (Barnett and O'Neill, 2010: 211).

6 Resilience and mobility

6.1 Introduction

In Chapter 4, I explored the major determinants that affect mobility endowments and mobility entitlements for individuals and households. I argued that the use of mobility was a core facet of lives within the village and the vast majority of households had at least one member who had migrated. At an individual level, young, male and literate members of the community predominantly employed mobility. The primary reasons cited for the mobility of these groups were economic differentials between sending and destination locations and the lack of opportunities for non-farm work in the sending areas. Poverty, ill health and the presence of dependents within households tended to restrict mobility. The role of institutions was crucial in mediating the mobility of people. *Hukou* registration and contingent impacts on access to education, welfare, and health provision acted as a barrier to mobility; this was especially the case for the older members of the population. In addition, the potential implementation of the New Village Redesign and the importance of maintaining a claim on agricultural land and housing also acted as a disincentive for the remaining household members to migrate.

In the Chapter 5, I focused specifically on two climatically driven environmental perturbations (flood and drought) to evaluate their role within mobility decisions and behaviours. I argued that the events under study were not outside of normal bounds and that the communities were well adapted to these types of disruption and weather-related variability. The responses of the communities to the environmental perturbations were multi-faceted and incorporated mobility in certain circumstances. The impacts of the perturbation on individuals and households as well as their responses were determined by the nature of the perturbation itself, the resources available, socially contingent experiences of the socially differentiated actors and on the broader institutional context present at the time.

In this chapter I bring together some of the insights generated in the previous two chapters and explore the resilience of individuals and households within the two communities as well as exploring the resilience of the communities themselves. Owing to the often small sample sizes and the resistance of resilience to easy characterisation and measurement (even through proxies) this chapter focuses on specific cases within the case study sites and should be considered as illustrative rather than representative (Carpenter and Brock, 2004). Although the focus of this chapter is on the mobility endowment and entitlement of individuals and the role that these play in mediating resilience to environmental change, I also consider the responses of individuals and households to environmental change in the round. I argue that those with greater

mobility endowment and entitlement are more resilient to environmental change as they have access to a greater range of possible responses compared to those with limited mobility endowments and entitlements although the relationship is complicated and this heuristic does not always hold.

The interaction between different levels of analysis is also very interesting. I show that increasing the resilience of one individual or household is not necessarily better for other individuals (even within the same household) or households. This finding builds on recent scholarship that critiques resilience for downplaying issues of power and politics by abstracting social and political processes. The access for individuals and households to different resources and institutions as well as the function of the institutions themselves effectively privileges certain socially differentiated groups and acts to segment the population. The between level interactions also reveal some very interesting dynamics especially when set against the broader societal changes occurring in urban and rural China at present. Out-migration of individuals can sometimes act to decrease the ability of other individuals within the same household to be mobile while increasing their resilience as well as their dependence on the out migrant, other household members and the continuity of the household. Similarly, the sustained depopulation of the villages brings into question the very viability of those villages. The spectre of village reorganisation and consequences for different households, given form through the New Village Redesign, is very real.

In short I argue that mobility and resilience are strongly interlinked; mobility as (mal)adaptation can result in both positive and negative changes in resilience at different levels. The interactions across and between levels are very complex and result in winners and losers. Levels are key; individual resilience may have negative impacts on household or village resilience for example. The chapter is structured as follows. Section one explores the contribution of mobility to the resilience of individuals. Sections two and three explore mobility in relation to the resilience of households and the community respectively before concluding in section four.

6.2 Contribution of mobility towards individual resilience

This thesis is interested in the ability of individuals, households and villages to cope with the impact of climatic variability and change. The focal 'system' of interest, to use resilience language, is that of the village and is defined in administrative terms (see 2.2.3 and 3.2.2 for more discussion on this issue). I am interested in the specified resilience to environmental perturbations driven by climatic variability (that is the resilience of what, to what) beyond which the behaviour of the inhabitants and the natural systems they rely on for their livelihoods begin to function in a different way

(Carpenter *et al.*, 2001; Walker *et al.*, 2014). Specifically, I am interested in the resilience of Dongdian village (and its inhabitants) to a drought event and Wanzhuang village (and its inhabitants) to a flood event. Although I am defining the focal point of the study at the village level I am interested in three levels and the interactions between them: the individual, the household and the village, whilst concurrently drawing on the wider social and political context.

The focus of the study is social rather than ecological: with the aim to explore some of the political and power issues that are embedded within any social processes and revealed through responses to environmental change. In so doing, the analysis helps to foreground some of the normative issues that often remain hidden within more ecologically focused resilience analyses (Armitage *et al.*, 2012; Brown and Westaway, 2011; Cote and Nightingale, 2012; Coulthard, 2012; Marshall and Marshall, 2007). At an individual level the concepts of adaptability and transformability offer a useful means to conceptualise the (im)mobility of actors within the two case study sites. The focus on the individual level also reveals some of the tensions inherent in when conceptualising interactions as part of a social-ecological system, particularly around issues of agency, inequality, and access (Cote and Nightingale, 2012; Keck and Sakdapolrak, 2013).

Three different types of (im)mobility were found in the case study sites:

1. Mobility was utilised as a strategy to relocate and take up a new livelihood elsewhere.
2. Mobility is deployed intermittently and permits the individual to stretch his or her livelihood to include multiple locations.
3. Mobility is not used at all and the individual remains in the village.

In all cases, across all three types of (im)mobility links with the sending area were retained although the strength of the links varied considerably.

6.2.1 Leaving the village: swapping one set of risk and exposure in individual patterns of mobility

The decision of individuals to swap one location and all that it entails with another is determined by individual preference structured by social processes acting at a variety of levels from the global down to the local. Assessing the individual level of resilience to environmental perturbations is made more complex by the mobility of the individual as, by moving, they replace one set of risks and opportunities (actual and perceived) with another, different set of risks and opportunities (actual and perceived). Analysis of

interview material, survey data and rural appraisal activities has revealed some interesting dynamics concerning individual resilience and the linkages with levels above.

Wang Bing left Wanzhuang for Shanghai about 20 years ago (in the early 1990s), in his mid-twenties with his wife and first child. Initially, Wang Bing used his tractor (hired it out to the local population in Shanghai) to provide him with a livelihood. Over time, Wang Bing has become established in Shanghai and now owns and manages a small car hire transportation business. At an individual level, Wang Bing's decision to leave can be conceptualised as adapting or transforming⁷¹ his life and livelihood from that of a rural farmer to an urban worker. During the interview Wang Bing reported that other options for increasing the amount of money that he made and improving his livelihood was not possible if he remained in Wanzhuang. For example, he states

It was less common that people [were] going out to work but mainly farm work at home. Farmland was contracted to households and the market was not active, everyone is doing farm works at home (20130710 Interview Wang Bing).

This quote highlights the limited options available to Wang Bing to adapt his livelihood in Wanzhuang ('the market was not active'). As a result of the inability to improve his live in Wanzhaung, Wang Bing opted for change that was more substantial. The way of life practiced by Wang Bing in the village was consciously swapped for a different way of life and livelihood. The adaptive strategy of getting out is reported in other studies exploring resilience at an individual level such as Marshall and Marshall (2007) and Coulthard (2012).

The ability of Wang Bing to migrate is influenced by a number of social processes operating at different levels as revealed during the interview. At a societal level, the easing of movement restrictions and gradual opening up of the economy created opportunities for Wang Bing that were not available to his parent's generation. The easing of movement restrictions and increased opportunities in urban areas contrasts with the limited opportunities in rural areas. At an intermediary level, Wang Bing describes how his move was facilitated by his family contacts (a cousin), highlighting the importance of networks in enabling mobility. At a more local level, Wang Bing

⁷¹ The degree to which the decision is conceptualized as an adaptive response or a transformative response is unclear owing to the conceptual fuzziness and overlaps between the two terms especially when applying them to units of analysis (individuals) rather than systems (see section 2.2.3). The analytical focus of this study is on the individual and their resilience to environmental perturbations and the strategy of leaving the village to seek work and opportunities 'outside' is considered an adaptive response. This position is common across much climate change and adaptation literature (see, for example, Adger and Adams, 2013; Agrawal and Perrin., 2009; Goulden *et al.*, 2009; Morton, 2007; Paavola, 2008; Pouliotte *et al.*, 2009).

described his family as wealthy (in the top few within the village) suggesting that the asset base (financial capital) was available to support Wang Bing's decision. Finally, Wang Bing talked about the 'mutually agreed' decision between himself, his wife (who also came to Shanghai) and his parents that he should migrate, reflecting a supportive family environment.

The characteristics outlined above highlight the resources (capacity) that Wang Bing utilised to enable his migration decision (mobility endowments). Wang Bing converted these resources to mobility entitlements resulting in a new livelihood and life in Shanghai. The new life in Shanghai represents the outcome or post response migration pattern to constrained livelihood options in Wanzhuang. Wang Bing considers his current life and livelihood to be a more desirable state than the one he left behind in Wanzhuang. When asked how he envisages his life had he not migrated Wang Bing says,

It will not be as good as now. Migrant workers have benefitted a lot from the reform and opening up introduced by Deng Xiaping⁷², which is encouraging business. It was a much better ideological line when comparing to Chairman Mao's era that people [farmers] were not allowed running private business but doing agricultural works only regardless of you willingness or talent. ... [W]e are satisfied, honestly. ... Farm works only make just enough for surviving. A family of seven or eight would easily use up all the money earned. It still will not make much even [with] zero land [agricultural] tax by the Government (20130710 Interview Wang Bing).

By adapting his life through the deployment of migration Wang Bing has fundamentally shifted the portfolio of climatically driven environmental change he is exposed to. Wang Bing is no longer reliant on agricultural livelihood options or on the employment at the one major employer in Wanzhuang – the brick factory. Wang Bing increased his (specified) resilience to livelihood disruption associated with weather-related variability by practicing what Coulthard, quoting Lister categorises as 'Getting out' (Coulthard, 2012: 4). However, whilst leaving Wanzhuang attenuated certain risks (risks of injury or livelihood disruptions) others were intensified or gained. For example, the security of the initial livelihood practiced in Shanghai was likely to be less robust than a combination of working in the brick factory and farming in Wanzhuang (although this insecurity has decreased over time and the rewards are greater).

⁷² Deng Xiaoping was the *de facto* leader of the Communist Party in China from 1978 to 1992 (although he never held any of the positions traditionally associated with the leadership of the Communist Party).

Similarly other risks associated with an urban immigrant lifestyle are likely to be increased. From an environmental perspective issues such as air pollution, water logging due to intense rainstorm events, inundation and damage associated with typhoons as well as heat-related health issues could become more of a risk in the future (Finlayson *et al.*, 2013; Quan, 2014; Wang, J. *et al.*, 2012; Wang, M. Z. *et al.*, 2012; Wang, X. *et al.*, 2013; Wong *et al.*, 2013; Wu *et al.*, 2012; Yin *et al.*, 2013). From a social perspective, Wang Bing is very much the 'poster migrant', a self-made man with a sustainable household economy. However, in migrating, Wang Bing has fundamentally shifted his relationship with the state and is no longer able to legitimately access a range of services including education for his children or government sponsored social protection schemes (Fan, 2002; Foresight, 2011; Xu, 2013; Zhang and Tao, 2012; Zhang *et al.*, 2011).

Wang Bing's story contrasts somewhat with the experiences of Pan Li highlighting the interactions of processes at multiple levels and the difficulties in distinguishing between agency and choice. Pan Li is 33 years old and left his home in Qianwei (part of the same administrative village as Dongdian) when he was 16 years old. Pan Li recalled a conversation with his father when he was deciding whether or not to leave the village to search for work.

Pan Li: At that time my dad was like, we four or five [children] were all in school, my dad seemed like couldn't afford, then I was the eldest so I said to dad that ... 'I would just drop out, and go out'. And there were people went out that was the same age as me, he told you [me] 'how good is the world outside, what kind of situation is it'. I wanted to see the world too, he told you [me] 'how it works, have a look at a new world. And can still make money [and] help to lighten the load of the family'.

RA: Oh so your dad said this, you were will to came out as well?

Pan Li: That time my dad said 'that's all I can do, I want you to keeping going school, it's your choice, if you want to go to school, I will support you, it's ok for me to be hard'. I heard my dad said [this], so I couldn't bear, deep down in my heart, [I] feel like life's already hard and it's gonna be even harder. [So I went out and have b]een out for several years and [it] didn't really help him with anything (20130721 Interview Pan Li).

The extract shows the significance of the family's socio-economic condition in influencing the decision of Pan Li to leave school and search for work. There are two other notable features of the quote that are worth highlighting. First, Pan Li refers to other people migrating reflecting its increasing normalisation as a livelihood strategy

and one practiced by people of school age. Second, the impact of Pan Li's migration on the family's circumstances ('didn't really help him with anything') was limited highlighting the difficulties in escaping from a situation of poverty.

Having opted to leave school and search for work Pan Li utilised family contacts and networks to work in a number of locations before arriving in Shanghai where he worked in a computer factory. Whilst Pan Li was working in the computer factory, his father became ill and eventually died. During this period, Pan Li returned home regularly to visit his father. As a result of these visits, Pan Li lost his job at the factory highlighting the insecure nature of much migrant work.

[I] was working in [the] computer factory, during it I heard that my Dad was sick. I went back home quite often, he was like, after a while his condition got better. After a while he was dying, then finally, the company, the company was there were loads of people, if you always have your own stuffs [issues], It would be hard to in charge of, so the leader said ... simply you leave the factory, why, because it's good for both you and me, you have issues back at home, like this, finally I left and went back home (20130721 Interview Pan Li).

In subsequent sections of the interview, Pan Li revealed that he had borrowed about 100,000 RMB to fund medical care for his father that needed to be repaid. Furthermore, Pan Li revealed that he had taken the decision with his siblings to give the farmland in his village to someone else, as it no longer makes economical sense to farm. Pan Li stated that he and his brothers would have to remain in the village to farm rather than earn money elsewhere and they simply do not own enough land to make any money.

The ramifications of the loss of Pan Li's father are profound and highlight the linkages between members of the same family. In this case, Pan Li and his siblings relied heavily on their father to maintain a presence in their home village supported through the subsistence farming activities. As Pan Li's father became unwell Pan Li lost his job and quickly accrued debts that are yet to be paid off. Following the death of Pan Li's father, the siblings could no longer afford to farm the land and had to give it up to someone else losing a vital connection to their village and a social safety net should things not work out in the future. Furthermore, Pan Li expressed feelings of sadness and loneliness at the separation he endures from his wife and daughter (who remain in his home village) and the huge gap between his life and that of the more established urban residents around him.

As with Wang Bing, Pan Li elected to migrate to seek new livelihood opportunities in urban areas. As with Wang Bing, this changed the resilience profile of Pan Li and he

was no longer as exposed to livelihood variations associated with environmental change owing to his participation in the waged employment market. However, the account of Pan Li also reveals the significant impact that teleconnected⁷³ family shocks (Adger *et al.*, 2009a; Eakin *et al.*, 2009) have on a person's resilience and some of the more fundamental institutional constraints (poverty, family shocks, insecure livelihoods associated with wider social institutions in China) that question the degree to which people are actively influencing their surroundings and reimagining their future or merely existing within a space constrained by a variety of institutions. Lastly, the account of Pan Li also highlights that he is putting up with his life, managing his expectations and living with loneliness and a degree of resignation as to his personal and familial situation. This adaptive preference or adjustment of expectations does show resilience but potentially negatively impacts on wellbeing, highlighting a divergence between the two concepts that is often not made explicit in the literature (Béné *et al.*, 2014; Coulthard, 2012).

6.2.2 Stretching livelihoods across space

Set within the context of the household a number of individuals elected to stretch their livelihood activities across multiple spaces. Within the village, the majority described farming as their main livelihood activity. No questionnaire data was collected on the activities practiced by this group of people in their other locations but interview data and informal conversations with villagers did reveal a range of activities including factory work, litter picking and recycling, construction work, general labouring and administrative duties (20140205 Interview Pan Hua, 20140203 Interview Wang Zhou, 20140204 Interview Wang Chung, and 20140205 Interview Pan Xiong). The administrative activities seem somewhat incongruous in relation to the other more manual and unskilled livelihoods and are unlikely to be typical: these activities were reported and practiced by those who had a level of education that was significantly above the average for the village.

Wang Chung has a history of working as a teacher or administrator, and a construction labourer on water projects. Wang Chung worked initially in the locality and then in more urban sites such as Zhangou Town, Anhui Province. Currently, Wang Chung works outside for a company involved in highway maintenance and returns to his home village several times a year to participate in festivals and the very busy agricultural seasons. The ability of Wang Chung, who has above average levels of schooling for

⁷³ Teleconnections is a term that was originally used in climatology in relation to 'any transmission of a coherent effect beyond the location where the forcing occurred' and has been appropriated more recently to explore, for example, the impacts of globalization on vulnerable communities in relation to migration (see Eakin *et al.*, 2009: 400, quoting Chase *et al.*, 2005).

the village, to stretch his livelihood across multiple destinations including Shanghai, Zhejiang, and Jiangsu has enable him to utilise his skills and earn considerably more than he would do had he remained within the village and its environs. For example Wang Chung states that,

Right. I work outside and come back for seasonal planting which only last several days. And my wife will do other things such as spraying insecticide. And I will come back again for the harvest. ... Now I get a much better income. You know people in my age can't earn a lot. If I stay at home, I will have free time of almost eight months between the time you plant the wheat and the time you get the harvest in Autumn. ...For the farming work, you just need to do the cleaning work, spray insecticide and extirpate weeds. And there are no companies at all in our village. So if I stay at home, I am a free labor [sic]. Now I go outside and earn about sixty thousand Yuan a year, which is quite a thing among people in my age (20140204 Interview Wang Chung).

The excerpt demonstrates the value in stretching livelihoods to exploit additional opportunities to boost income. The activities of Wang Chung provide evidence of spatial diversification from which one can make certain inferences about his resilience. Referring back to the diagram adapted from Coulthard (2012) and Brown and Westaway (2011) (see Figure 2-1), Wang Chung is diversifying his livelihood in terms of the number of activities he is practising and also diversifying across space. This focus on multiple livelihoods in multiple locations provides a number of benefits that aid resilience to shocks and stresses that he might experience within his hometown (Foresight 2011: Chapter 3). Wang Chung is not solely reliant on agriculture reducing the likely impact of variations in yield due to weather related shocks and stresses. Furthermore, the networks and contacts that he has developed due to the wider range of activities he has practiced will also help should he decide or need to relocate to other areas. Finally, should his work outside of Wanzhuang end then he can fall back on the farming and networks within the village and surrounding area.

The quote also reveals how the changing livelihood practices amongst rural communities are having impacts on gender roles within the household. In this example, Wang Chung reveals the role his wife plays in maintaining the farming land whilst he is absent. A similar phenomenon was also reported by Pan Hua who maintained all of the farming land whilst her husband was working away (20140205 Interview Pan Hua). These examples show the gendered implications of increased levels of mobility on the remaining (female) household members in regard to farming and other aspects of community life. The building of houses, participating in village matters and liaising with people outside of the household are all typically the preserve of men but will need to be

undertaken by the *de facto* household head in the absence of the male (Adger *et al.*, 2002: 29-30; Murphy, 2002: 112; Murphy, 2004).

Through the use of mobility Wang Chung and Pan Hua's husband have accessed additional livelihood opportunities, enabling the remainder of Wang Chung's family and Pan Hua to stay in the village. In both cases, the male head of the household has utilised their mobility endowments and deployed their mobility entitlement to access additional livelihood opportunities. Conversely, whilst the mobility endowments of the wives of the male household heads are likely to have increased through remittances and increased levels of income more generally, their ability to deploy these endowments (their entitlement) has actually decreased owing to their more prominent role within the household. For example, whilst Wang Chung has become increasingly mobile, the opportunities for Wang Chung's wife to be mobile have decreased, as greater onus is placed on her to keep the home and maintain the farmland during the absences of Wang Chung. However, the decrease in the mobility entitlements of the *de facto* household head is unlikely to decrease their resilience to environmental change owing to the benefits accrued for the household as a whole.

The contrasting experiences described above reveal some of the complex interactions between mobility and resilience for individuals within the same household unit. Whilst the mobility endowments and entitlements of individuals change through their own agency, the actions of others have significant implications. This analysis supports the work of Stark and colleagues (Stark and Bloom, 1985; Stark and Levhari, 1982; Stark and Lucas, 1988) who argued that migrant decisions are not made by individuals but often taken jointly by the migrant and a group of non-migrants (the other household members) through which risks are pooled. At different points in time, each party assumes the role of insurer and insuree thus enabling the household as a whole to benefit from greater rewards. This conclusion brings to the fore some thorny methodological issues concerning the extent to which one can explore individual resilience when it is embedded so strongly within the household unit (see sections 7.3.2 and 7.3.3 for a more detailed discussion on this methodological point).

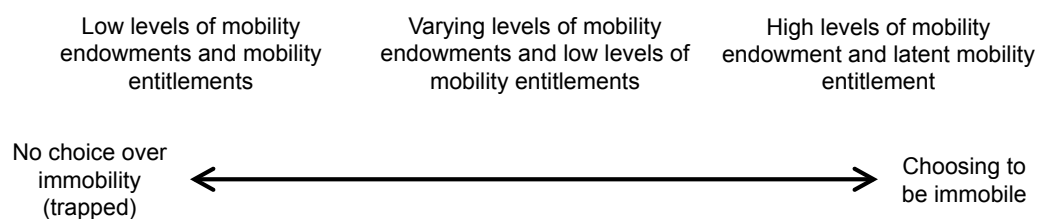
6.2.3 Lacking mobility and its means implications

Individuals are immobile for a specific set of reasons and these do not apply homogeneously throughout the village. Immobility arises as a result of a variety of, often covarying, endowments and entitlements (such as personal preferences, poverty and life stage) linked with broader institutional drivers including family relations and expectations and wider social structures (as touched on in the previous section). For example, life stage is very important, with younger members of the case study sites

much more likely to be mobile. The corollary, that older members are less mobile, is also born out by the analysis: with the eldest generally less mobile. Within the case study sites some key characteristics are apparent that often differentiate mobility and mobility potential from the more immobile.

The conceptual framework presented in Chapter 2 draws a theoretical distinction between those who are able to be mobile but chose to remain immobile at one end of the spectrum and those who are unable to be mobile (except *in extremis*) at the other end of the spectrum (see Figure 6-1). The agency of individuals plays a crucial role within this spectrum, human actors are never just passive in the face of change (or stability) and will seek to understand and prioritise certain behaviours based on their understanding of the world around them (McLaughlin and Dietz, 2008). The distinction between whether an individual is trapped or voluntarily immobile is likely to influence their level of resilience to shocks and stresses and has been picked up in the Foresight report (Foresight 2011: 35). The influence of immobility on a person’s resilience is likely to be felt more acutely when it covaries with other factors that contribute to a high level of vulnerability (such as poverty). This section focuses on three broad categories of individuals who are immobile and explores interplay between these groups and their resilience.

Figure 6-1: Immobility spectrum and examples of the relationship with mobility endowments and mobility entitlements.



The interviews provide a good level insight into individual perspectives on the impact of the climatically driven environmental perturbations on those who remain *in situ*. Wang Hong-Li is 82 and lives with his wife, aged 81, in Wanzhuang, he has one daughter who lives in a village about 17km away. Wang Hong-Li and his wife have two mu of land that they farm for themselves. During the interview Wang Hong-Li stated that he could not farm any more land owing to his physical condition, he is reliant on help from his extended family (nephew) and also some hired labour to do some of the more strenuous activity for him. Wang Hong-Li is *Wu Bao Hu* and his wife is *Di Bao Hu*. These two social welfare schemes provide approximately 1,800 RMB per year. Wang Hong-Li also gets a payment through an old age insurance scheme of 60 RMB per

month. Despite this, Wang Hong-Li is still very reliant on agriculture for his subsistence. For example Wang Hong-Li stated that,

If I don't farm, I have nothing to eat [and] [I]f we can get good harvest in crops, we have enough to eat, while if not, we don't have enough to eat (20140203 Interview Wang Hong-Li).

When faced with the flood, Wang Hong-Li reported making use of two coping strategies (compared to the average for the village of 3.21) and these were both utilising external support (organisations and local village elders and or officials). In addition to this, Wang Hong-Li also received remittances from his daughter. When asked whether he would consider moving to the same village as his daughter Wang Hong-Li indicated that the lack of finance was a significant barrier in addition to the more general perception that you have to remain where you were born. Wan Hao-Cun⁷⁴ provided some further information on the issues limiting the ability of Wang Hong-Li to move; Wang Hong-Li is not allowed to move if he wishes to retain his social welfare payments and the proposed host village must sanction the move (unlikely in this situation).

Wang Hong-Li's ability to respond and cope with shocks and stresses are constrained in a number of ways. At a cognitive level, the ability of Wang Hong-Li to conceive of life beyond the immediate area appears constrained. The cognitive limits are perhaps related to a combination of life course and the impact of the stricter controls in movement up until the mid to late 1980s (after which reforms on *Hukou* really began to have an effect in opening up the country). Other than one daughter (who remains close but is considered part of her husband's family) and a nephew, Wang Hong-Li has no other surviving immediate relatives. Wang Hong-Li's social network is very limited and strongly focused within the village. Institutionally, the state structures at a local and national level are working as barriers to mobility. Finally, Wang Hong-Li is poor (as demonstrated through his *Wu Bao* status) with very limited assets, suffers from ill health and is reliant on agriculture for his subsistence.

Wang Hong-Li appears vulnerable to local (weather) shocks or stresses that reduce his yield and the functioning of his social network through which he is able to convert social endowments into social entitlements. For example, an event that negatively impacts on the ability of Wang Hong-Li to farm whilst concurrently affecting his daughter's household (reducing her ability to provide remittances) and disrupts his

⁷⁴ Wan Hao-Cun (pseudonym used to protect confidentiality) is a local cadre responsible for security and order within the village administration; the closest equivalent of his role would be a Warden (*Dian Zhang / 典狱长*). Wan Hao-Cun accompanied me on some of my interviews in Wanzhuang, helped to facilitate the survey questionnaire and participated in the RRA activities.

local support network would further increase the pressure on the minimum guarantees provided by the state. In this instance, Wang Hong-Li has limited resources and low levels of mobility endowments and mobility entitlements brought about by his reliance on the state. The low levels of wealth and resources possessed by Wang Hong-Li are major impediments to his ability to be mobile and also influence his resilience to shocks and stresses.

Referring back to Figure 6-1 above, Wang Hong-Li is at the trapped end of the immobility spectrum with limited potential for change in the future. Wang Bao-Zhi offers a different case in point. Wang Bao-Zhi is 59 years old and lives with his wife in Wanzhuang. Wang Bao-Zhi has been teaching for more than 36 years and currently earns approximately 3,000 RMB per month⁷⁵. In addition to his teaching Wang Bao-Zhi also maintains (with his wife) six mu of farmland, some livestock, and practices other natural resource based livelihood (fishing and forestry-related) activities. The guaranteed income from teaching allied to the other livelihoods practiced by Wang Bao-Zhi and his wife has enabled them to put his four children through junior school and send his third child to college in a local town (Huainan). In addition, Wang Bao-Zhi appears to have a larger network of social contacts to utilise as evidenced by the geographically dispersed locations of the people that were consulted with on previous mobility decisions and the location of his immediate family (reside in other cities in Anhui, Hubei and Shanghai).

Despite these high levels of resources and mobility endowments (dispersed social networks, above average income, diverse livelihoods), Wang Bao-Zhi appears to have constrained levels mobility entitlements for two reasons. First, his relationship with the state through his role as a teacher limits his ability to move unless officially sanctioned (Han, 2013)⁷⁶. Second, his home and land provides a social safety net for his children should they need to return. For example, Wang Bao-Zhi reported that his son went outside to work (prior to his son's marriage) and would return if he lost his job or was unable to find employment. In this case, the security provided by Wang Bao-Zhi has enabled his son to seek work in urban areas and access higher wages whilst minimising the risks associated with the lack of job security (20140203 Interview Wang Bao-Zhi). This example demonstrates the adaptation of Wang Bao-Zhi and his household to exploit the opportunities presented as China develops and the importance of the rural family home in minimising and sharing risk between family members (Stark and Bloom, 1985; Stark and Levhari, 1982; Stark and Lucas, 1988).

⁷⁵ The average annual net income by household in rural areas is 6232 RMB in 2011 (China Statistical Press, 2012).

⁷⁶ Although this only applies whilst he remains in work and could act in opposition should the state relocate him elsewhere.

A third example comes from the village of Dongdian. Pan Lijuan and her husband are in their mid-sixties and live in Dongdian. They share their household with an uncle who is in his 80s and their son and wife who are in their 30s. Pan Lijuan have two other children, a son who owns a company in Xi'an and a daughter who moved out of the family home when she got married in the mid-2000s. Her husband and son both work outside: her husband does short-term stints, mainly construction, in Sanmen County, Zhejiang and her son works with his brother in Xi'an. Pan Lijuan cares for her uncle and four children. The key role Pan Lijuan performs in providing care (for her uncle), access to education for her grandchildren (due to her son's mobility) and maintaining the agricultural land (as a result of her husband's mobility) severely constrains her mobility and has increased her workload. When describing how she felt about caring for four grandchildren and her elderly uncle she reported that 'it is tiring' (20140205 Interview Pan Lijuan).

In this instance the resilience of Pan Lijuan is likely to be increased, due in part to the mobility of other members of the household. The asset index score is 0.298, which is at the top of the bottom quartile. In addition to the income generated through her husband's waged labour and money from caring for her grandchildren, the household also maintains a variety of livestock and practices fishing and forestry-related activities. At an individual level, Pan Lijuan's resilience to weather-related disruption to her livelihood has increased as a result of the mobility practiced by other members of her household. First, Pan Lijuan has a range of income sources that reduce her dependence on the natural resource base. Second, the dispersed nature of the family has increased their network and contacts beyond the immediate area. Therefore, disruptions to the locality, whilst affecting local networks, would not impact on networks in other locations, which could still be utilised to provide livelihood and other opportunities. Third, should Pan Lijuan and family choose to migrate, they have experience and contacts in other parts of the country as well as more assets increasing the chances of a successful move. Cumulatively, these factors suggest Pan Lijuan is more resilient to local weather related variability owing to the mobility of other members of her household.

However, the additional burden that Pan Lijuan experiences owing to the absence of household members suggests that in other ways her wellbeing and general resilience may have decreased. For example, the increased physical workload associated with the farming activities may increase her susceptibility to a variety of health problems. Mentally, the onus of caring for and raising four grandchildren will be very demanding. In addition to this, Pan Lijuan also has to look after and care for her elderly and infirm uncle as well as providing food and maintaining the home. These demands placed on

Pan Lijuan could decrease her wellbeing overall despite an increase in resilience to weather related shocks or stresses. The potential disjuncture between resilience in one facet of her life and decreased wellbeing more generally again draws out some potential issues with drives to increase resilience as a poverty and development priority, as highlighted by Béné and colleagues (2014) in their recent review article on resilience, poverty and development.

Three issues are worth highlighting by comparing the cases of Wang Hong-Li, Wang Bao-Zhi and Pan Lijuan. First, dependency on natural systems is acknowledged as a critical factor in influencing the level of social resilience (Adger, 2000; Aleksandrova *et al.*, 2014). In this instance, all three interviewees report that they are not dependent on agriculture (generally and in relation to climate change specifically) but the reasons for this lack of dependence differ considerably and help to reveal some issues concerning the tensions between resilience and wellbeing. For example, Wang Bao-Zhi and Pan Lijuan have a much higher level of resources compared to Wang Hong-Li as described above and this is also reflected in their asset index scores of 0.277, 0.285 and 0.008 respectively. Wang Bao-Zhi and Pan Lijuan are not dependent on agriculture owing to their household's diversified livelihoods (including non-agricultural work) supporting other studies that have found migration decreases reliance on biophysical resources (see Qin, 2010 for example). In contrast, Wang Hong-Li is not dependent on agriculture owing to his reliance on state welfare payments. Wang Hong-Li manages his life, in part, by managing his expectations or adapting (down) his preferences as evidenced by this quote '[e]ven you don't like here, you have to live here. You were born here' (20140203 Interview Wang Hong-Li).

Whilst dependence on agriculture does not map directly on to resilience it does serve to illustrate a wider point about potential issues concerning the (often implicit) assumption that resilience (in this case of an individual to an environmental perturbation) is something to strive for as a specific, uncritical policy priority. Wang Hong-Li demonstrates resilience to a variable climate but this is achieved through structures that limit his mobility and deliver only a minimum standard of living. Similarly, Pan Lijuan's increased resilience to weather related variability is derived by an increased burden and stress in other aspects of her life.

Second, as mentioned above, Wang Hong-Li lacks the ability to move as he is locked into a relationship with the state that severely limits movement by tying benefits to place of residence. Wang Bao-Zhi, in contrast, although tied to a specific location by his job and the need to maintain a family homestead for his children (specifically his son), does demonstrate greater mobility endowments and hence potential to move.

The ability to move provides Wang Bao-Zhi with a greater array of options regarding his potential living space if required compared to Wang Hong-Li. The two cases illustrate the crucial relationship that the state continues to play in mediating mobility for a significant number of people and households. Additionally, the analysis also highlights how continuities from the pre-reform era are still very important and active as asserted by Deshingkar (2005) and Zhang (2008).

Third, and notwithstanding the significant diversity across China, the increased burdens experienced by Pan Lijuan is symptomatic of the changing nature of rural families in Chinese society (Luo and Zhan, 2012). The account highlights how gender roles within the household are being fundamentally transformed by the increased mobility of the rural population (Gaetano and Jacka, 2004). Increased access to labour markets and the abundance of employment opportunities in more urban areas, allied to the substantial wage differentials amongst other social changes, has reshaped rural household structures placing more onus on those (women) left behind to undertake the triple function of housework, caring and farming (Liu, 2014; Murphy, 2002; Nguyen and Locke, 2014).

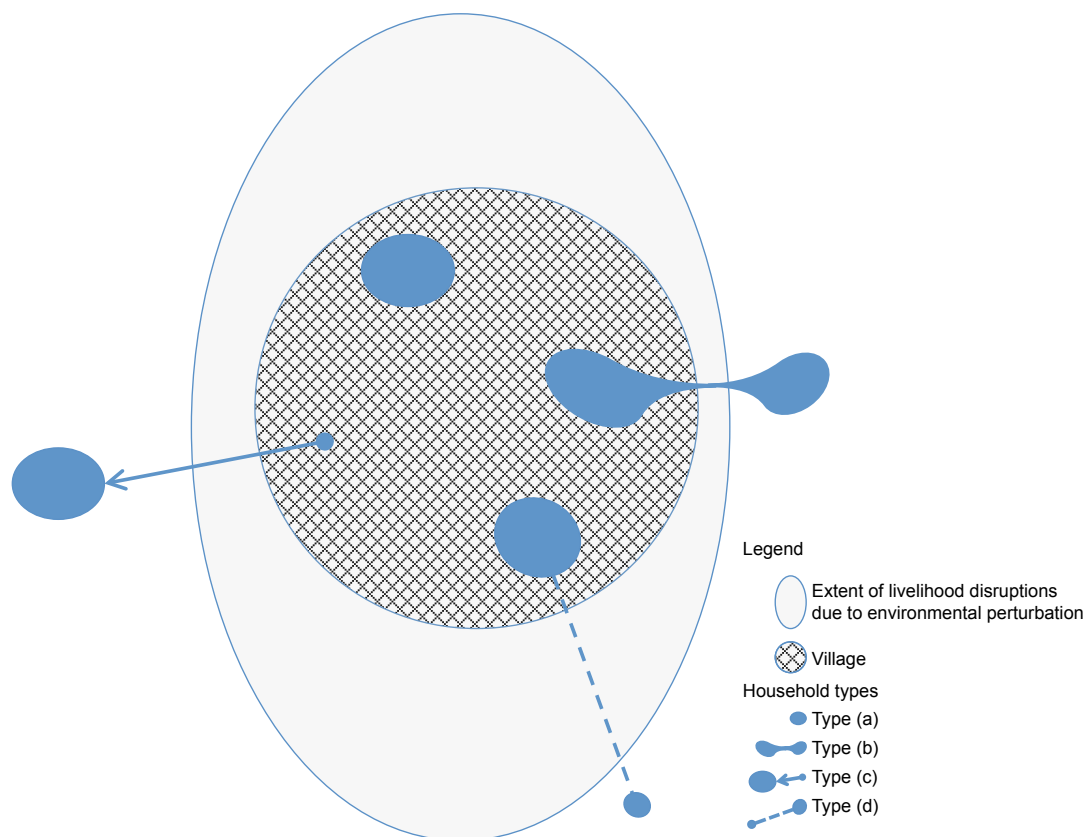
6.2.4 Mobility as a means to diversify livelihood options and access locations unaffected by the environmental perturbation

In this section I have explored three types of mobility practices: relocation, stretching of livelihoods and immobility. In the cases presented above mobility does appear to have increased the resilience of individuals and households to livelihood shocks and stresses brought about by weather related variability. The use of mobility constitutes an adaptive response to constrained livelihood opportunities in an economically and ecologically marginal location. Mobility has enabled individuals and households to diversify their livelihoods and exploit opportunities for boosting income. In so doing, individuals and households have increased the number of potential locations they can utilise to generate livelihood opportunities, some of which may be outside the area physically affected by the weather driven shock or stress (see Figure 6-2).

Social connections are very important in the process of opening up and increasing the accessibility of certain locations. Within these social connections, family ties are crucial in securing employment opportunities and in linking the migrants with their ancestral home. These teleconnections are bidirectional: they can facilitate greater connections and also act to reduce the ability of individuals and households to make or maintain connections as revealed through the impact that a family illness or death (for example) has on the migrant and the subsequent ripples that affect all household members. Furthermore the analysis also highlights some of the potential pitfalls of the recent

social turn for resilience and its adoption within development discourse (Béné *et al.*, 2014; Brown, 2014). Increasing one's resilience does not necessarily also increase wellbeing. Caution is needed when seeking to build resilience to ensure that wellbeing (for example) is also enhanced (as a co-benefit) rather than sacrificed (as a trade-off). A case in point being the issue of adaptive preferences, discussed by Sen (1999) and, more recently, by Béné *et al* (2012; 2014).

Figure 6-2: Schematic showing disruption caused by a local event on households with different kinds of spatial organisation (see notes for more details).



Notes

Schematic shows a hypothesised livelihood disruption (blue area), a fictional village affected by the livelihood disruption (hatched circle) in which agriculture is the dominant livelihood source and different types of spatial household organisation.

Household types:

- (a)** Household is historically immobile with no notable connections outside of the village. Livelihood and coping strategies significantly affected by the environmental perturbation.
- (b)** Mobility utilised by household members to maintain multiple livelihoods diversified across two locations. Livelihood within the village affected by environmental perturbation but livelihoods outside the village unaffected by the environmental perturbation. Stronger physical connections are maintained with affected area as sometime in the year spent living there.
- (c)** Whole household had previously migrated out of the village and is not affected by environmental perturbation.
- (d)** One or more member of the household migrates for a significant period of time (could be permanent). The migrant member is not affected by hazard and able to provide remittances for household members who remain in the affected village.

6.3 Contribution of (im)mobility towards household resilience

In this section I focus on two types of mobility and two types of immobility. For the more mobile households I explore the similarities and differences between those who stretch their livelihoods across multiple destinations but spend at least a proportion of the year in the village and those households who contain members that have moved away and no longer maintain a *de facto* residence within the village. I also look at those who remain *in situ*, the immobile, this group is disaggregated into those who reported never having utilised mobility at any point in the lifetime of the household and those who have been mobile but not within the reference period (10 years for longer term mobility and one year for shorter term mobility). The study does not focus on whole households that have left during this period, which is a significant, but unavoidable omission. The bias introduced by this omission needs to be borne in mind during the analysis. The sample I draw from have demonstrated, by remaining *in situ*, that they are more immobile (whether as a result of their own agency or through structural issues constraining their ability to move).

6.3.1 Stretching lives and livelihoods: working and living in multiple locations

Literature on resilience of resource dependent communities frequently sites diversification as a key means through which households can overcome shocks and stresses (Bennett *et al.*, 2014; Ellis, 1998; Ellis, 2000; Goulden *et al.*, 2013; Nguyen and James, 2013). Similarly, Agrawal and Perrin identify diversification and mobility as two of four analytical types of coping and adaptation strategies (the others being storage and communal pooling). Agrawal and Perrin (2009: 355) argue that diversification 'reduces risks across assets owned by households or collectives' and is 'highly varied in form' whilst mobility is described as 'perhaps the most common and seemingly natural response to environmental risks'.

Through analysis of the household survey and interviews, the importance of circular or more seasonal migration was apparent. Out of 97 households, 27 practiced some sort of shorter-term or more seasonal migration constituting 30 individuals. The majority of those household members practicing this type of movement did so for periods of between one and three months (excluding the 'Don't know') on an annual or seasonal basis (see Table 6-1 and Table 6-2).

Table 6-1: Duration of departure for short-term mobility for individuals reported retrospectively for the previous 12 months (from date of survey).

	Dongdian (n=18)	Wanzhuang (n=12)
< 2 weeks	22	17
>2 weeks <1 month	6	0
>1 month - <3 months	56	42
Don't know	17	42
Total	101*	101*

*Totals equal 101 per cent due to rounding.

Table 6-2: Frequency of departure for short-term mobility for individuals reported retrospectively for the previous 12 months (from date of survey).

	Dongdian (n=18)	Wanzhuang (n=12)
Annually	39	50
Seasonally	33	25
Monthly	6	17
Weekly	6	0
Other	6	8
Don't know	11	0
Total	101*	100

Total equals 101 per cent due to rounding.

Table 6-3 shows groups of households (n = 61 with 11 excluded as incomplete⁷⁷) disaggregated by (im)mobility type and their scores on a range of self-perceived and externally derived measures (see Appendix 3 for methodology used in constructing each of the indexes) and can be used to provide an insight into the respective levels of resilience. Analyses of households that practiced mobility but retained the *de facto* residence within the village (circular or seasonal mobility) reported larger improvements in yield and a low dependency on agriculture compared to those households that only utilised longer term migration or practiced a combination of different types of mobility. Furthermore, the households using only short-term migration were scored highest in the wellbeing ranking and asset index. Although the differences for individual measures between mobility types were not significant and need to be treated with caution, the overall picture painted is powerful: this group of households are doing well on a range of self-perceived, community perceived and independently assessed measures especially when compared to the other groups that utilise mobility.

⁷⁷ Within the sample, one household reported only return migration and is not shown (in addition to the excluded households) as the sample size is too small for meaningful comparison.

Table 6-3: Self-perceived measures of change for yield, finance and wellbeing over the last five years (from date of survey) and snapshot measures for wellbeing and wealth (using an independently derived asset index as a proxy) and dependency on agriculture for households exhibiting different types of (im)mobility.

Migration type	N	Yield ^a	Finance ^a	Well-being ^a	Well-being ranking ^b	Asset index ^c	Dependency ^d
Short term	8	92	75	83	71	0.600	69
Long term	23	83	70	81	57	0.430	83
Combination	16	75	75	81	62	0.457	80
Immobile	14	81	81	95	57	0.519	68

^a Self perceived measures of change compared to approximately five years ago derived from questionnaire responses; lower numbers equate to less positive change.

^b Externally perceived one-time measure at date of wellbeing ranking RRA exercise (20130414 RRA2DD and 20130501 RRA2WZ); lower numbers equate to less positive change.

^c Externally defined measure (scale of 0 to 1).

^d Self perceived dependency on agriculture at present day derived from questionnaire responses; lower numbers equate to less positive change.

One possible explanation for the difference between the groups revolves around the use of mobility. This data suggests that those households that practice short-term migration have been better able to exploit conditions to their advantage than households that have practiced no migration or long term migration. The self-reported changes over time allied to the external derived measures imply that this group of households are more resilient to socio-economic and environmental changes in the locality than the groups exhibiting other forms of mobility.

Thinking more deeply about why this might be the case, one possible explanation relates to the level of psychological, social, physical and, possibly, financial investment a household retains within the village compared to those that practice more long-term mobility. Intuitively, a household that spends a greater proportion of their time in a place is likely to invest more in that place in terms of social interactions, personal commitment and so on; this sort of psychological investment may engender increased opportunities that impact upon livelihoods. Conversely, for those that have weaker links with their home location, their incentive, propensity and ability to invest (socially as well as financially) may be less.

Two quotes from household members living in the case study sites highlight the high level of personal and emotional investment villagers retain with their village especially when juxtaposed with the more distant relationships their children have.

You see my son prefer to work outside, but we like working here, it is our hometown after all, for example, you know everything here and people you meet are all acquaintance. But if you work outside, you live in the factory ... but you will not contact with the local people or people from other places, so we like working and living in the hometown (20140203 Interview Wang Zhou).

Everyone is going out. ... What is neighbour after all? What is the meaning of having relatives when you don't get to see them for years? Sometimes they come back visiting relatives like Spring Festival. But they are not at home in festivals like Mid-autumn Day, the Tomb-sweeping Day and other festivals. Relatives don't get to be together on festivals, because they are not home. The relations between lineal relatives are still fine due to the blood, but the cousins don't feel so close with each other. They are not familiar with each other. ... The youngsters would like to come home as long as there are jobs. The economic situation is getting better and better gradually. They earned money from the city and will invest their hometown. They want to be at home. They miss their hometown (20140204 Interview Wang Chung).

The quotes reveal the value placed on personal connections and the importance of retaining strong family ties, which are perceived as weakened for those who spend significant amounts of time apart. Furthermore, the quotes also touch upon the respondents' attachment to their home and village and their pride and contentment with their surroundings. In describing the changing relationships between those who no longer live and work in the village on a regular basis, the quotes reveal increasingly distant relationships and a growing lack of familiarity showing some of the costs of working and living outside as perceived by those remaining in the village.

Juxtaposing the thoughts of those who remain with those who go provides an interesting contrast. The following two quotes from migrants provide an insight into some of the issues that those living and working away from the village experience.

My parents do not need our money, they have made enough money for themselves, my parents have four children and we all give money to our parents when visiting home, e.g. Chinese New Year. My parents have four acres of land, which generate enough money to support their living (20130710 Interview Wang Bing).

It depends. You can't be one hundred per cent sure, right? Maybe if the business here is no longer good then we'll go back home, the New Village Project [Redesign] back home possibly, after some time, it's going to Plan for the new village, I'm going to buy a house back home these days. ...Long term? Oh this! I don't know, I'm not sure at the moment, right? (20130712 Interview Pan Hao.)

In both examples, the quotes show that, despite working outside, the desire to retain social connections with their home village remain and this manifests itself in the provision of remittances (in the case of Pan Hao) or the desire to invest in certain circumstances (in housing through the New Village Redesign in the case of Wang Bing). However, Pan Hao also states that his parents do not need his money as they generate enough through their farming and Wang Bing expresses a great deal of uncertainty regarding his longer-term plans. Generally, those migrating on a longer term, more permanent basis are more likely to be the next generation on and keener to live an urban life. Although principles of *xiao* and *bao* remain strong, the younger generation will have a dual commitment towards themselves (and their own families) and that of their parents' household. This dual responsibility compares to the more singular focus of those who use mobility to facilitate shorter-term shorter-duration moves: these individuals tend to be the household head with a primary focus on the household in the village (Jakobsen, 2014; Murphy, 2002).

The affinity for the village expressed by those who remained was somewhat at odds with the description given of the village by those who had left. A consistent theme and tension running through all of the interviews with migrants who were living in Shanghai was the village as concurrently idyllic (a place to retire to, to rest and relax) and unidyllic (backward, underdeveloped, lacking opportunities, hard) (Gaetano, 2004; Unger, 2002). Two quotes show this tension.

Take my own case as an example, we three children were raised up in a fairly poor family, and we didn't experience a lot, so after we left the village we found out that there are so many things we didn't know, while they seemed so easy to others. Then we had to try to adapt it, learn everything little by little, which takes time (20130715 Interview Wang Meiyang).

How to say about the village? Mostly we have better environments, better air, and easier life in the village. Quiet and tranquil. For instance in my hometown, the old would past their late life there, bits of stroll now and some of fishing then, raising some chicks and ducks, that is rather comfortable life. But Shanghai is a place for work, ambitions, and targets, isn't it? (20130713 Interview Wang Dao.)

On the one hand the village is a place of safety and stability; on the other it is a sign of the past and stagnation. China is moving forward and developing at pace: in order to keep up the young must do the same (Jacka, 2005; Zhang, 2014).

The interview data when viewed with the additional analysis from the questionnaire suggest that those households practicing shorter-term migration retain an affinity for

the village that is unlikely to be matched by those individuals who leave for longer time periods. The implications are that, even with the increased flow of remittances back home, the levels of household capital and investment in assets may be higher for households with circular migrants rather than those with longer term migrants. For example, households with circular migrants can use the income generated from their non-farm activities to boost incomes without sacrificing farm-related productivity. Whereas, the impact of losing labour, in the form of longer term out mobility, reduces the ability of those households to sustain increases in yield as additional investment is reliant on remittances. At the other end of the spectrum those households that are immobile lack the means to invest in and improve their livelihoods owing to the limited income that can be derived from a livelihood that relies more exclusively on agriculture (Stark and Bloom, 1985; Wang *et al.*, 2014).

Returning to the issue of resilience. A family practicing circular mobility appears well adapted to cope with livelihood shocks and stresses in the village. The farm-related income provides an income base that serves to meet the subsistence needs of the household. This income source is augmented by other non-farm activities that act as insurance when the income from agriculture is disrupted. The resilience is derived both from the diversity of livelihoods practiced and an increase in the geographic area potentially accessible to the household (see Figure 6-2 above). The spatial livelihood diversification provides insurance should one source of livelihood become insecure whilst also enabling households to utilise areas unaffected by a local disruption.

6.3.2 The immobile and what they reveal about resilience

Those households that did not practice any form of mobility within the reference period are likely to fall into two groups. The first grouping includes those households who have utilised mobility in the past but not in the reference period under study. The second grouping relates to those who have never used mobility and always remained within the village. Disaggregating the households that were identified as immobile into those that have never employed mobility and those that have used mobility but not within the reference period reveals some interesting patterns within the data (see Table 6-4, Appendix 3 shows for the methodology used to construct each of the indices).

Table 6-4: Self-perceived measures of change for yield, finance and wellbeing over the last five years (from date of survey) and snapshot measures for wellbeing and wealth (using an independently derived asset index as a proxy) and dependency on agriculture for immobile households.

Migration type	N	Yield ^a	Finance ^a	Well-being ^a	Well-being ranking ^b	Asset index ^c	Dependency ^d
Immobile	14	81	81	95	57	0.519	68
Presently immobile	8	71	75	92	62	0.543	69
Permanently immobile	6	94	89	100	50	0.487	67

^a Self perceived measures of change compared to approximately five years ago derived from questionnaire responses; lower numbers equate to less positive change.

^b Externally perceived one-time measure at date of wellbeing ranking RRA exercise (20130414 RRA2DD and 20130501 RRA2WZ); lower numbers equate to less positive change.

^c Externally defined measure (scale of 0 to 1).

^d Self perceived dependency on agriculture at present day derived from questionnaire responses; lower numbers equate to less positive change.

One of the most notable differences between those households who identified themselves as never having used mobility and those who had been mobile but not in the reference period is the difference between the self-perceived measures of change and the externally derived measures. For all self-perceived measures (yield, wellbeing and finance) the group that had never employed mobility reported more positive change than the group who had been mobile (94, 89 and 100 compared with 71, 75 and 92 respectively). The externally derived measures (the perception of wellbeing and the asset index) both suggest the converse, with very low scores. The historically mobile households were perceived to have higher levels of wellbeing (62 compared with 50) and had a higher mean score on the asset index (0.543 compared with 0.487).

The difference in the self- perceived and externally perceived measure of wellbeing could be related to the ways in which the households have adapted their lives within the village and the very positive association of migration and mobility with success and wellbeing. Rural appraisal activities exploring the causes and effects of migration revealed a universally assumed positive relationship between migration and improved living standards (20130503 RRA6WZ and 20130417 RRA6DD). Similar sentiments were also reported in interviews with migrants and with the villagers. The following quotes capture some of the perceived differences between rural life compared to the urban life.

Being out [of a rural area] is like, I feel my income is little, the kid out can never compete with other [urban] kids as for eating and wearing so we just go to school at home [in the village] (20130721 Interview Pan Li).

[T]he modern generation today, either affected by TV or migration, has similar ideologies to the urbanites' (20130715 Interview Wang Meiyang).

The best is in other places, not the rural. What can they do in the countryside? It's no use to planting crops only (20140205 Interview Pan Lijuan).

The people who are staying in the village don't go out for work, and they beg for food. There are children and adults begging for food (20140203 Interview Wang Hong-Li).

The quotes highlight some of the real and imagined differences between urban and rural lives and will undoubtedly impact peoples' perceptions of migrants and non-migrants and migrant and non-migrant households in terms of their standing. Migrants and households containing migrant members (whether current or historic) are likely to be viewed favourably compared to rural dwellers (Jacka, 2005; Unger, 2002).

The self-perception of positive change in the lives of the households that do not migrate is greater compared to those that have been mobile in the past. In fact, this group scores the highest even when compared to the mobile groupings (see Table 6-3). Additionally, and somewhat surprisingly, the households that reported never utilising migration also reported less reliance on agriculture. This suggests that these historically non-mobile households may have invested more in farming to bring about greater improvements in yield and also diversified their livelihoods within a spatially constrained area. Additionally, this group may also have invested more personally in the locality (they want to make it work) and, therefore, perceived greater levels of change. From an external perspective this group of households could be perceived to have missed out on the benefits brought about by migration and, hence, have lower externally perceived measures of wellbeing. For the currently immobile households (not utilised mobility within the reference period but have done at some point previously), self-perceived measures of change may be influenced by the rapid development in China that they have experienced first hand. For those that have been mobile and returned, the perception of the rural lifestyle may be more negative (slower paced and less progressive for example). This perception of rapid urban development and rural stagnation could influence the self-perceived levels of change (Jacka and Gaetano, 2004; Murphy, 2002).

The reasons for return are also likely to significantly influence self-perception and the perception of others on the returnees. Individuals that have been successful and come back to marry or invest in the local areas will have a very different socio-economic profile and outlook on life (in addition to how they are perceived) compared to someone who returns because they have not been successful or are needed to support other family members at home. For example, Wang Zhou returned to Wanzhuang after working in Shanghai because his father was ill and needed looking after. When describing the impact on their lives Wang Zhou and his wife said,

Wang Zhou: Of course there is some influence, a little worse.

Wang Zhou's wife: Certainly worse than we working outside. ... We harvest a little grain and do the farming at home.

Wang Zhou: Eh, do some farm work (20140203 Interview Wang Zhou).

The impact on Wang Zhou's life, materially, will be large. In addition, Wang Zhou had to adjust from an urban lifestyle back to a rural one (Connelly *et al.*, 2010). Lastly, the perception of his life now compared to what it was will be very different having experienced migration. All of these issues are likely to play a part in how he perceives himself and his family. Although no interviews were undertaken with returnees who were considered successful it is not hard to image a very different outlook on life compared to that of Wang Zhou.

6.3.3 Stretched livelihoods and the perception of mobility

The analysis has shown that, across a range of self-perceived, externally perceived and independently calculated measures, households practicing shorter-term mobility generally perform better than either those households practicing longer-term mobility or immobility. Exploring these differences in more detail, I have suggested that households practicing shorter-term mobility are able to maximise their income from non-farm sources whilst also maintaining their agricultural livelihoods especially when compared to households practicing longer-term mobility. The households practicing longer-term mobility lose labour and possibly do not gain as much from the absent household members. This conclusion casts doubt over some previous studies that have explored links between farming and migration and inferred a negative impact on productivity for shorter-term, more circular migration (see, for example, Li and Tonts, 2014).

Households that are currently or who have never utilised mobility exhibit large differences in self-perceived changes but universally fare worse under externally

perceived or defined measures. I have argued that these differences could be explained due to the households' relative investment in the local area (permanent members will invest more of their lives in an area compared to those who spend less time there) and the influence of mobility on their perceptions and others' perceptions of them. Additionally, for those that have used migration in the past but not currently the reasons for return are also likely to be very important in influencing their currently lives and livelihoods.

The idea of an increase in the spatial area within which a household operates vis-à-vis the spatial extent of the livelihood disruption suggests that households who are able access more locations are more resilient to environmental shocks and stresses as they can migrate out of danger. Households (or individuals), in addition to accessing an area physically, also require access at a social and cognitive level. Contacts and networks as well as the psychological ability to conceive of life in a different location are necessary to help facilitate any move. The corollary, that those households with smaller accessible spaces, are more at risk as they are unable to escape (spatially) the impact of the shock or stress is also interesting and raises the issue of trapped populations (Foresight 2011) and their lack of resilience.

6.4 Contribution of (im)mobility towards village resilience

The massive change that China has experienced as it transitions from a predominantly rural society to an urban one is profound and has shaped the development of the two case study sites. Both sites have witnessed sustained depopulation and the out migration of the majority of working age adults, substantially altering the demographic profile of the villages. This change has far reaching implications for the resilience of the villages to climatically driven environmental perturbations specifically and their more general resilience. In this section, I argue that the mobility of the population in general has had positive impact on the specified resilience of the village but a negative impact on the general resilience.

6.4.1 Formal institutions enhance specified resilience of village

Resilience of the villages to weather related variability appears high due to a number of factors. The role of formal institutions has helped to mitigate the impacts of flood and drought events. A key symbolic improvement in the livelihoods of rural households was the Government's decision to abolish agricultural tax in 2006 (Long *et al.*, 2010; Sun *et al.*, 2013). Although only accounting for a comparatively small percentage of a rural families income the tax still acted as a drain on resources, especially in times of hardship (Wang and Shen, 2014). More immediately, emergency response to flooding

appears well developed with the army and medical personal on hand, in addition to local officials to provide food shelter and medical care during the evacuation. Similarly, during the drought, the county government in tandem with the village committee organised for irrigation equipment to be provided for those areas that were affected by the drought. The government subsidized payment for this service with the village committee also providing a contribution (that was made up of individual household contributions) (20140206 Interview Pan Yao). Drainage and other engineered measures to reduce the vulnerability of the village to flooding, especially, have also been implemented in the last 10 to 20 years (see 5.3.3).

A variety of formal measures to spread and share risk are available to households and individuals within the case study sites. At an individual level, endowment insurance helps to support adults in old age. The insurance scheme requires a contribution of approximately 100 RMB per annum up to maturity at the age of 65. Once an individual reaches the age of 65 the scheme provides 720 RMB per annum increasing up to about 900 RMB per annum depending on the age of the recipient (it increases as the person gets older) (20140203 Interview Wang Zhou, 20140203 Interview Wang Hong-Li, and 20140206 Interview Pan Hong). The government also provides insurance for health care costs but the scheme only partially covers the costs of the treatment (20140206 Interview Pan Hong). In addition to endowment and health insurance for rural residents, agricultural insurance was also available to protect households and production teams (depends on how the insurance was organised) against some of the losses associated with weather related variability or pests and diseases (see 5.3.3) (20140205 Interview Pan Lijuan, 20140206 Interview Pan Hong, and 20140206 Interview Pan Ji).

At a household level, formal institutions were also important for providing information and advice about how to respond and cope with the impacts of the flood or drought. Of those households that indicated that they could recall the flood or drought (n=73), 41 per cent reported seeking advice from local government or village leaders or elders in relation to the event itself. The main issues households were interested in getting information about how to cope with the immediate impacts of the event (41 per cent) or how to recover (10 per cent).

All of the institutions outlined above provide a means to help villagers cope with the threat of the environmental perturbation and respond if and when one occurs. However, all of the measures are predicated on an assumption of immobility (for example, the insurance schemes all require a local *Hukou*), on helping people to remain in place. Despite the sedentary bias in more formal institutions, mobility does play a huge part in

the lives and livelihoods of villagers and although its relationship with resilience is less clear-cut.

6.4.2 Mobility and implications for the village

The importance of mobility in building village resilience is complex and reflects a number of within and between level interactions. That mobility helps individuals and households to access livelihood opportunities that enable them to contribute significantly to the household economy is not in question. Nor is the role of remittances and the centrality that they play in facilitating the transfer of capital from urban centres to rural areas. In the case study sites, 56 per cent (n=73) of households reported being currently in receipt of remittances (see 5.4.2). However, the migration of individuals and whole households from the village has resulted in a significant depopulation, which may impact on the ability of the village as a whole to recover from environmental perturbations. Table 6-5 provides a summary of some of the main linkages between the individual, household and the village. The table draws out some of the feedbacks between and within the different levels of analysis as well as the complexity and co-existence of positive and negative relationships between individuals and their mobility.

During or immediately after the flood event between a half and a third of households reported an increase in unplanned, short-term return migration suggesting that people came back to support the recovery process. This information can be read in one of two ways highlighting some of the issues in disentangling the contribution of mobility to resilience: either, there was not enough labour in the village to recover from the flood so people returned to provide support; or, the labour within a household was distributed to enhance earning and flexible enough to be reallocated in times of hardship. Both of the possibilities outlined are plausible and the return migration during or immediately after the flood is likely to be a mixture of the two depending on individual household circumstances (see 5.3.4).

At a household level (Table 6-6), increasing longer-term migration acts to remove people and resources (to a lesser extent) from the village. The human and financial capital is removed from the village as people and households leave. The impact of circular or seasonal migration presents a different set of issues. Increasing income derived from multiple livelihoods will bring assets into the village and potentially increase the amount of available financial capital. These assets can be used to invest in village livelihoods boosting productivity or increasing wellbeing.

The impact on the social sphere is harder to gauge although a decrease in the absolute number of people, their skills, expertise and knowledge is bound to impact

negatively. That said, the increased connections fostered with non-local areas and potential new knowledge and investment that this could bring about will have a positive effect. Land remains in the village and is often transferred to other households through formal or informal rental agreements providing income and insurance for the families that have departed and an additional or increased income source for those who take it on (Li and Tonts, 2014; Yan *et al.*, 2014). Conversely, some land and plots can remain underused owing to the difficulty in reclaiming the usage rights from absent households (Yangang and Jisheng, 2014).

Table 6-5: Taxonomy of linkages and impacts on mobility endowments and entitlements at the level of an individual.

Mobility of individual within household			
	Social resources	Mobility endowment	Mobility entitlement
Other individuals within household	<ul style="list-style-type: none"> • Increase resources available to other household members as additional sources of income are secured to supplement agricultural income (in the form of remittances or direct payment for circular mobility) • Increased legitimacy of claims by others on benefits of mobility • Greater connections with the outside world due to increased geographic dispersal of other household members 	<ul style="list-style-type: none"> • More resources are available but demands on other household members increase due to absence of member • Access to education for younger members may improve and higher quality educational establishments may be sought elsewhere • Access to employment opportunities increased for other (younger) household members seeking employment out of the village 	<ul style="list-style-type: none"> • Decrease for those household members with responsibility for dependents (although may not be unwanted) • Increase the mobility entitlements of younger household members, with regard to educational access in other locations • Increase the mobility of younger household members seeking work opportunities elsewhere to due increase in asset base and geographically more dispersed social networks
Household	<ul style="list-style-type: none"> • Increase resources of household as additional sources of income are secured to supplement agricultural income • Impact on status variable depending on which members working outside of the village • More potential connections with non-local areas 	<ul style="list-style-type: none"> • More resources which can be deployed to facilitate mobility entitlements if desirable • Increased contacts in non-village locations to facilitate mobility • Psychologically, shown a preference or compulsion to be mobile (Morrissey, 2009: 37) 	<ul style="list-style-type: none"> • Committing to a rural lifestyle and demonstrating a desire to remain in situ • Fitting mobility into a rural location • Maintain claim on land and home (physical entity)
Village	<ul style="list-style-type: none"> • Increase in assets in the village (although 'owned' by specific households). May result in increased investment in farming and capital assets. 	<ul style="list-style-type: none"> • Decrease hollowing of village as household remains • Stretching of the village horizons as individual members have experience of non-local areas 	<ul style="list-style-type: none"> • For circular mobility, remaining in the village and increasing the asset base of individual households increases the potential for a greater level of investment in the new village design scheme exists • Conversely longer term mobility out of the village increases the potential for settlement rationalisation as significant depopulation occurs over time

Table 6-6: Taxonomy of linkages and impacts on mobility endowments and entitlements at the level of a household.

Mobility of whole household within village		
Social resources	Mobility endowment	Mobility entitlement
Individuals within Household	<ul style="list-style-type: none"> The mobility endowment of individual members within the household will change but is strongly influenced by the intra household structures (such as gendered differences). May have decisions concerning migration imposed upon them 	<ul style="list-style-type: none"> Household mobility increases but for individuals within the household entitlement to be mobile determined by inclusion or exclusion from the decision-making process. Entitlements defined by ones 'legitimate, effective command'. Therefore a decision imposed arbitrarily, whilst resulting in mobility, may not be as a result of increases in mobility entitlements. Conversely, for those involved in the decision-making process, the entitlement to mobility increases.
Other households	<ul style="list-style-type: none"> Little change to the mobility endowment although possibly slightly increased Reinforces the social norm concerning migration thereby adding legitimacy in the eyes of other households 	<ul style="list-style-type: none"> Increased slightly with expanded geographical spread of social networks Encourage other households to leave (chain migration)
Village	<ul style="list-style-type: none"> Have a limited impact on the resources of other households. Although land may be transferred through formal or informal rental agreements increasing potential income from agriculture Reduction in number of people in the village reducing social interactions Decrease in the support available (for example labour) Decrease in assets available to the village as households move away Possibly an increase in vacant plots and unused farmland as often difficult to reclaim (Yangang and Jisheng, 2014) Negatively impact on the village institutions owing to dramatic decrease in population 	<ul style="list-style-type: none"> Increase in village 'hollowing' (Liu, Y. <i>et al.</i>, 2010; Liu, Y. <i>et al.</i>, 2013; Long <i>et al.</i>, 2012) Increases the potential for settlement rationalisation as significant depopulation occurs over time

At a village level, the vitality of the village has undoubtedly suffered owing to the sustained depopulation. I visited both case study sites at different points throughout the year. The difference in the feel of villages comparing my visits during the Chinese New Year period and at other times was substantial. During the Chinese New Year period, when families return home, the villages felt alive and full of people of all ages; wherever I went there was always lots of laughter and conversation. People seemed very happy and joyous: the village was bursting with life. At other points in the year, the village was quiet and sedate; there were very few young people and adults between the ages of 20 and 50. My impression was reinforced by a comment made by a migrant in an interview in Shanghai who, when recollecting her time in the Wanzhuang growing up stated that

It used to be really lively during festivals there, with all the children frolicking around on the Mid-Autumn nights, and families baking home-made mooncakes. But now everything is different (20130715 Interview Wang Meiying)

In another example, a villager from Wanzhuang reported that it took between 10 and 20 days to clean up the village in preparation for the Chinese New Year with the implication that it did not take as long in the past (20140203 Interview Wang Zhou). These examples highlight how village life has been negatively affected by the increasing number of families and individuals that leave to make lives elsewhere.

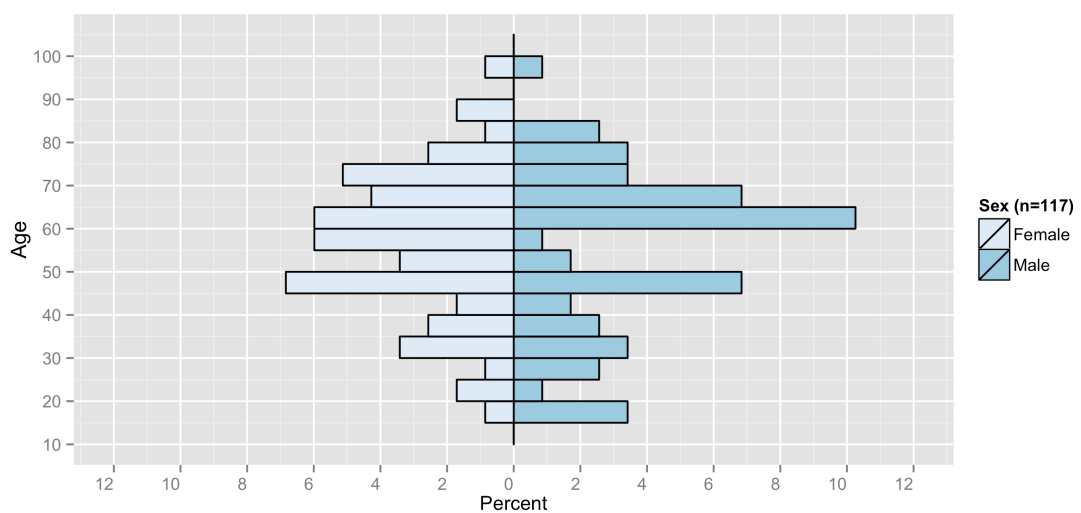
At a more fundamental level, the 'hollowing' of the village increases the potential for settlement rationalisation (discussed in more detail in 4.4.2). The prospect of settlement rationalisation questions the very viability of the village itself and the lives of all those inhabitants who currently remain. The policy of resettling whole villages in larger, centralized, storied buildings has been particularly controversial. The controversy led to the government stating that the merging or relocation of villages to larger scale settlements was not encouraged or supported (2013 No. 1 Central Document quoted in Yangang and Jisheng, 2014: 269). Despite this, the prospect of settlement rationalisation seemed very real for the inhabitants of both villages threatening people's wish to grow old in their home in the village that they have known all their lives.

The prospect of the New Village Redesign has resulted in a moratorium on new buildings and renovations of existing buildings. This moratorium acts as an incentive for people who wish to leave the village. They are unable to invest in new housing or undertake significant repair on existing properties (some of the properties that I visited in January 2014 were still requiring repair from the last significant flood in 2007). The resettlement plan and gradual depopulation of the village feedback on each other

increasing both the likelihood of settlement rationalisation and the propensity of people to leave the village. This has resulted in a ban on new buildings and renovations that act as an incentive for people to leave the village. Thereby reinforcing the tendencies of people who are already minded to leave.

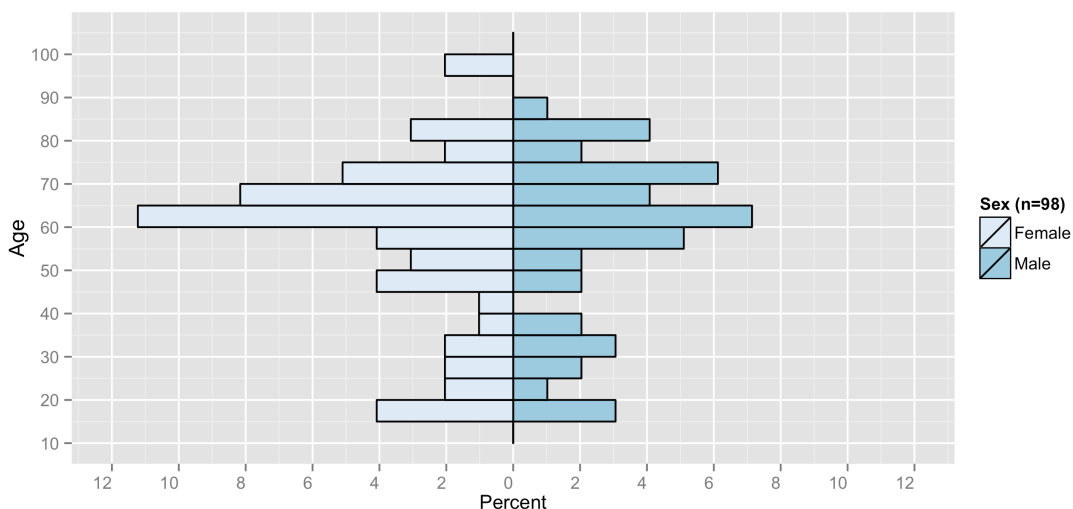
In addition to the feedback described above the decline of the population in Wanzhuang and Dongdian appears inexorable for a number of reasons. There are no significant employment opportunities in the local area and what employment opportunities there are cannot compete in terms of earning potential with more urban industrial jobs. This suggests that the working age population will continue to leave when searching for employment opportunities. Compounding the issue of depopulation is the age of the remaining inhabitants. The average age of all adults⁷⁸ for Dongdian is 54.8 years and for Wanzhuang is 56.3 years (see Figure 6-3 and Figure 6-4). The figures clearly show the large proportion of the remaining population aged 60 and over in both of the villages. In 2012, the life expectancy in Anhui was 75 (China Statistical Press, 2012). Over the next 10 to 20 years if no population replacement occurs then the villages' population could reduce by as much as 50 per cent.

Figure 6-3: Population pyramid for Dongdian for all people 16 years and older. Data from household survey conducted in June 2012.



⁷⁸ Defined as 16 years of age or older.

Figure 6-4: Population pyramid for Wanzhuang for all people 16 years and older. Data from household survey conducted in June 2012.



The depopulation and aging described above, will not only increase the likelihood of settlement rationalisation raising the spectre of those with low mobility entitlement (but varying levels of mobility endowment) moving at the behest of the state, but also highlights the lack of power and agency individuals and households exercise in certain situations and the continued importance of the state in mediating people’s mobility. Couched in terms of endowments and entitlements, individuals and households would lose the entitlement to be immobile, which is as important as the entitlement to be mobile.

6.4.3 Increasing village resilience but at what cost?

In the short-term, resilience of the villages to weather events such as a flood or drought appears high, especially considering the institutional support that is currently available and the coping and adaptation measures practiced by the households (of which some are related to mobility). However, as the population continues to age and adults of working age continue the tendency of working outside, the village will continue to depopulate and become increasingly vulnerable. This depopulation threatens the very viability of the village. Talking with migrants in Shanghai, some expressed a wish to return in their later years imagining the village as a sort of rural idyll. Some of the households that I spoke to within the village also expressed a desire that their children would return at some point to maintain the family house and lands. However, the younger generation are increasingly disconnected from a rural lifestyle and I question whether they would actually want or be able to return to a way of life that they left behind years previously.

Following this line of reasoning through to its logical conclusion raises the question of what happens to the current population when the village is relocated? The households will be further away from their land (an issue that was raised in opposition to the New Village Redesign project) and located in, perhaps, a considerably more urban area. Such shifts for the village population question the very relationship that these villages (and individuals therein) have with the land and its sustainability into the future. Biao (2007a) argues whole communities in rural China are being left behind socially and economically driven by fundamental differences in the relationship the state has with urban and rural areas. As Biao (2007a) highlights, the relationship that rural people have with the state is crucial in determining the future of the countryside. The New Village Redesign project highlights, not only some of the complex feedbacks that are influencing the prevailing trends of rural depopulation in the two case study sites, but also brings to the fore more fundamental issues associated with power and agency. In potentially relocating villages the state is exercising its power and preventing its citizens from exercising their entitlement to immobility. Some of the villagers I spoke with showed great attachment and fondness for their village and wanted the opportunity to grow old in a place they have known all their lives. In this case, an entitlement to immobility is as important as the entitlement to mobility yet is threatened by the potential actions of the state.

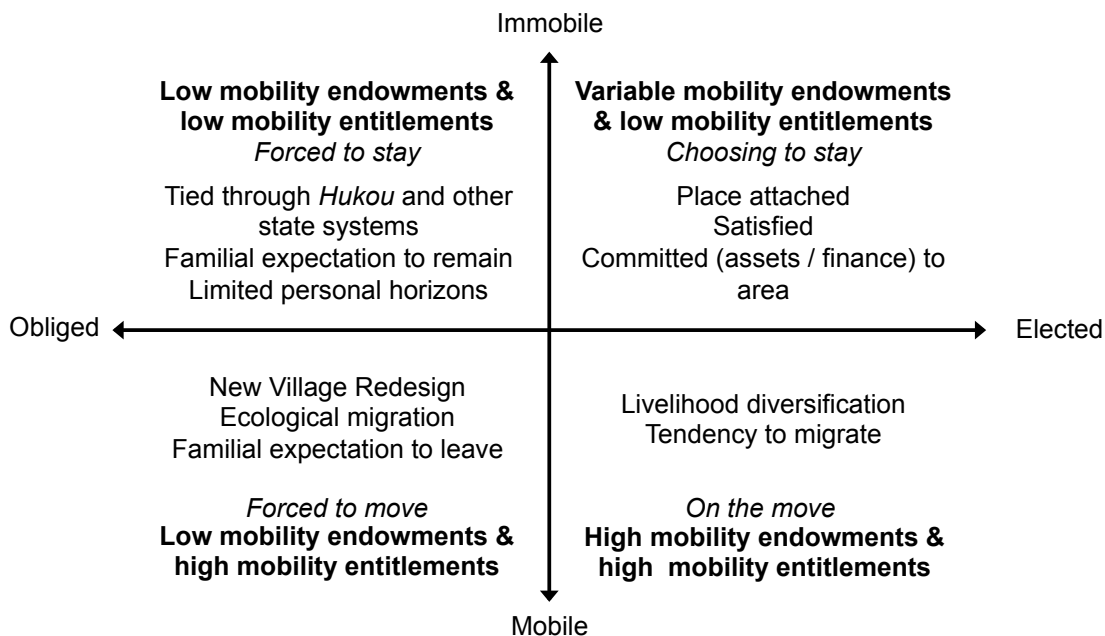
6.5 Conclusion

In this chapter I have focused on the resilience to climatically driven environmental change at three levels: the individual, the household and the community. At the individual level I looked at three specific cases: those who move to another location, those who split their time between more than one location but still consider themselves living in the village and those who remain in the village and do not use mobility. I have argued that households that have diversified their livelihoods across space have greater potential options if required thereby avoiding the worst effects of the flood or drought. In addition to diversification across physical space, working in other locations has also facilitated the development of larger social networks and increased in the personal, cognitive range they see themselves as operating in.

In examining the role of individual resilience I touched upon some of the tensions between actor- and systems-orientated approaches. As mentioned previously, Coulthard (2012) and Brown and Westaway (2011) explore the crossover between resilience and wellbeing. The authors of both papers draw on the work of Lister and present a taxonomy of actions along two axes: everyday - strategic and the personal – political / citizenship. Figure 6-5 below shows a reworked version of Lister's adapted

taxonomy focusing on mobility. The figure is differentiated along two axes: immobile to mobile and obliged – elected.

Figure 6-5: Adapted taxonomy of mobility showing different levels of mobility endowments and mobility entitlements with hypothetical examples based on the case study data.



I argue that those individuals and households at the elected end of the spectrum are more likely to be resilient to livelihood shocks and stresses than those at the obliged end of the spectrum. Furthermore I assert that this applies regardless of an individuals' or households' level of actual mobility.

At a household level, households that stretch their livelihoods across multiple locations appear to perform better than either households that are immobile or who contain members that are absent for longer-durations. I argue that this might be due to the level of investment that households are able to retain without compromising on the labour available for farming. Li *et al* (2012: 2-3) argue,

[S]pecial attention should be given to the effect of out-migration on rural household's self- development capability, which is fundamental to constructing family's livelihood activities in sending communities.

In this household model a greater burden of work appears to fall on the remaining household members, often the women, who are required to take on more roles traditionally the domain of men whilst also continuing to perform their traditional functions. Households practicing short-term mobility were less likely to reduce expenditure but more likely to adopt additional livelihood activities when responding to

the flood or drought suggesting that accessing additional livelihood options was easier for this group.

Looking at the immobile households showed that those classed as permanently immobile perceived themselves to be doing better when compared to the self-perception of other household groupings although the converse was true for externally derived measures. I assert that this difference between self-perception and how people are perceived is influenced by the impression that migration is a generally positive force. However, the positive perception of migration can work in opposition for those households who have returned and are not currently using mobility. For this group, their self-perception is negatively influenced by migration as they are no longer able to exploit the opportunities afforded by mobility.

Looking at the village level, institutions are well functioning within the village to support residents to remain *in situ* and to continue their rural livelihoods in the face of weather related environmental disruption. For example, insurance schemes are available and the county level government has been active in supporting flood prevention and drought relief measures. However, the continuing depopulation of both villages driven by economic marginality and the interpretation of national policies concerning the need to free up agricultural land strongly suggests that the village will be relocated at some point in the future threatening its very viability.

The analysis has also revealed the complexity and nuance that exists within the case study sites and highlights the need for research that probes beyond the household as the lowest unit of analysis. Decisions by individuals affect others within the household and the household itself (Nguyen and Locke, 2014). These dynamics are often not predictable and masked by analysis that only focuses on the household. As with intra-household dynamics, other resources, endowments and entitlements that individuals and households possess are not static. Similarly, institutions are also changing, shaped by the agency of individuals who are attempting to influence circumstances to their own ends. Capturing these dynamic processes is difficult and requires thoughtful methodologies that attempt to engage with this issue.

7 Conclusion

In this thesis I set out to investigate how (im)mobility influences the resilience of individuals, households and communities under conditions of climatically driven environmental change. Examining the role of mobility under conditions of environmental change provides an opportunity to explore the specifics of distinctly different pathways by which environmental change influences (the drivers of) mobility. Furthermore, through the use of a novel conceptual framework that permits the exploration of mobility endowments and mobility entitlements for differentiated social actors, issues of power and social heterogeneity are incorporated within a resilience framing, the lack of which is a common criticism of many existing resilience studies.

The structure of this chapter is as follows. The next section presents the main conclusion from the evidence presented in the thesis followed by a brief discussion on the key limitations of the research process. I then outline the key contributions to knowledge from a research (with a focus on resilience, migration and methodology) and policy perspective before concluding.

7.1 Summary of results

Chapter 2 identified the need for research to push forward thinking on the migration environmental change nexus. At a theoretical level, conceptualising migration has become increasingly complex, as scholars have sought to capture the plurality, difference and variation evident in the observed world. Within this increasingly pluralist field, there is an acknowledgement of the need to incorporate different levels of analysis and better integrate agency and structure into new theoretical approaches to refine understanding (Bakewell, 2010; Bardsley and Hugo, 2010; Castles, 2010; Castles and Miller, 2003; Greiner and Sakdapolrak, 2013; Massey *et al.*, 1998; McLaughlin and Dietz, 2008).

At an empirical level, the relationship between the environment and migration is complex with no consistent signal regarding the role of the environment. There is only a limited quantity of robust, empirical evidence (although this situation is slowly changing) and what evidence there is often pulls in different directions, demanding the generation of new knowledge (Kniveton *et al.*, 2008; Van Der Geest, 2011). Within existing studies, the actual processes through which the environment influences migration are often only postulated whilst the role of other drivers are acknowledged to be of considerable importance (highlighting the level of complexity) (Black, 2011; McLeman, 2013; McLeman and Smit, 2006; Morrissey, 2009; Perch-Nielsen *et al.*, 2008). Lastly, there are very few examples in English of empirical studies exploring the

links between changing environmental conditions and migration in China beyond those that look at resettlement programmes (Obokata *et al.*, 2014; Tan and Guo, 2007).

Resilience theory, rooted in social-ecological systems thinking, has been widely used to explore nature society relationships and the migration environmental change nexus specifically. Despite the use of resilience for analysis situated in the social field, resilience has been critiqued for failing to address issues such as power, agency and other more normative elements (Brown, 2014; Cote and Nightingale, 2012; Davoudi *et al.*, 2012). In responding to this critique, the thesis uses a conceptual framework that incorporates an adapted version of Leach *et al.*'s (1999) Environmental Entitlements framework, in an attempt to locate social difference and, by implication, power more centrally within a resilience framing.

To address the research gaps (theoretical and empirical) outlined above, Chapter 2 suggested three sub-questions that address different aspects of the main research question:

- a) What are the major determinants that affect mobility endowments and mobility entitlements in the case study sites?
- b) What are the processes by which drought and flood affect the endowment and entitlement to mobility at an individual, household and community level and how do these fit within broader adaptation strategies?
- c) Are those with greater endowment and entitlement to mobility more resilient to environmental shocks?

Chapters 4, 5 and 6 address the research questions above using evidence from two case study sites, Dongdian and Wanzhuang (in addition to interview data drawn from migrants in Shanghai). Dongdian and Wanzhuang are small (no more than 125 properties in either location), agricultural villages in the northeast of Anhui province. Both villages have a long history of out-migration and have experienced a gradual depopulation over the last 15 to 20 years. Currently, about half of the properties are unoccupied and the remaining population is elderly (average age in the mid-fifties). These two rural communities have experienced different types of climatically driven environmental perturbations and related fluctuations in natural resource availability. Chapter 3 sets out the methodology for the research and provides the context.

7.1.1 The major determinants that affect mobility endowments and mobility entitlements within the case study sites

Research within the case study sites reveals highly structured patterns of mobility. Mobility for and within households is high although a non-mobile minority is present. At

an individual level, the younger, more literate members of the villages are much more likely to be mobile whereas the elderly tend to stay behind. The profile of migrants varies by the type of migration practiced. Shorter-term movements are practiced by approximately equal numbers of men and women whilst males undertake a greater proportion of longer-term moves. A number of barriers to mobility exist including ill-health, poverty, old age and gender as well as dependence on a number of formal institutions linked to one's place of residence (through the *hukou* registration system). Key factors considered important in decisions to migrate tended to boil down to economic rationales and differences between sending and receiving locations although these were not immutable and appeared to change depending on the type of migration being practiced and the context of the question through which the data was generated. For example, issues considered important for shorter term movers were more likely to centre on attachment to place, local contextual factors and valuing the rural lifestyle, whereas longer term movers were more strongly linked to economic reasons and getting on (and up) in life. At a more abstract level (and not related to a specific move), formal institutional factors were more likely to be cited.

The processes driving migration are multiple and complex and influence in a variety of ways the processes through which resources are mapped on to mobility endowments and mobility entitlements. Migration decisions are a mixture of individual and more structural issues, highlighting the importance of theoretical approaches that attempt to better capture the dualism of agency and structure. The analysis revealed the importance of exploring the impacts of mobility decisions within households rather than just at the level of the household. In certain cases the increased mobility of one household member resulted in the decreased ability of other members to be mobile: an important detail that would have been missed with a focus on the household as the lowest unit of analysis.

Interrogating the different levels of analysis revealed some interesting feedbacks and synergies. The most notable were particularly evident around the proposed New Village Redesign project, which acted to inhibit village regeneration through the moratorium on new building and building renovation. This moratorium and the uncertainty more generally about the scheme (its start date, the impact it would have and whether the inhabitants of the village would be required to relocate) arguably encouraged more people to leave and acted as a disincentive for people to return. Interestingly, at a national level, the New Village Redesign project has arisen, in part, due to the continued depopulation of the countryside and is designed to tackle the very issues that it now appears to be contributing to in the case of Dongdian and Wanzhuang.

China is a rapidly developing country and this fast-paced change is also evident in a number of institutions that impact on the processes through which mobility endowments and entitlements are generated thus influencing who is and is not mobile. The compulsion for younger members of the village community to leave, household heads to stretch their livelihoods across multiple locations, or the potential disruption caused by the New Village Redesign questions the degree to which people are able to act independently of the social structures around them and shape them to their own ends or are performing within predefined parameters and rules. These examples (and others not cited) highlight the issue of immobility endowments and entitlements as an important corollary to mobility endowments and mobility entitlements. The right to remain is as important as the right to leave but clearly not a given in certain circumstances. As with mobility endowments and mobility entitlements, immobility endowments and entitlements are also mediated by a number of institutions working at different levels of analysis.

Finally, the institutions themselves are also subject to change from internal and external pressures. The increasing ability of Chinese citizens to exercise mobility is one example of this (certainly compared to 30 or so years ago). Household sizes, more generally, and multigenerational households, more specifically, are decreasing and this has important implications on those who remain. The traditional gendered division of roles is evolving (particularly in cases where the male household head also works away), monetized forms of support are growing in significance and the role of the state vis-à-vis the household is changing.

7.1.2 The endowment and entitlement to mobility and their fit within broader adaptation strategies in the context climatic variability

The impacts of the two climatic perturbations under study were strongly linked to their pathways of impact and severity. The drought in Dongdian predominantly affected agriculture with little direct impact on other aspects of peoples' lives. Although the effects on households' agriculture were varied, the time taken to recover financially was fairly homogenous with the majority of people reporting a recovery within six months to one year. As with Dongdian (although more severe and universal), the effect of the flooding in Wanzhuang was felt strongly through disruptions to agriculture. The flooding also had an impact on other aspects of people's lives from the disruptions caused by the evacuation of the village through to the damage to the built environment and communication infrastructure. Interestingly, the time taken to recover financially was much more varied in Wanzhuang when compared to Dongdian.

Both villages appeared well adapted to cope with the impacts of the drought and the flood. A number of changes to farming practices were implemented in both sites to cope with the disruption associated with the climatically driven environmental change from sowing more seeds, using more labour and irrigating during the drought, to the managed evacuation of the village and the planting of fast growing legumes immediately after the flood had receded. Beyond changes to farming practices, households in both sites employed a multiplicity of adaptation strategies that drew upon a variety of asset classes.

The analysis also suggested that more conventional notions concerning the logical progression through which different strategies are adopted in times of stress might not hold in all circumstances. This finding indicates that, in certain circumstances, ideas underpinning poverty traps and the impacts of ratchet effects need to be viewed more critically. Additionally, the presence of specific responses for each site suggests that certain strategies may be better suited to addressing the impact of certain types of events (the ability to reduce the number of dependents in affected families in the case of Wanzhuang) whereas others could be used to contribute to broader development aims (continued ability to access jobs and labour markets in times of livelihood shock or stress).

At a village level, a number of formal institutions were present and supporting households to cope with and recover from the impacts of the environmental perturbation. In the case of agricultural insurance, the scheme did not prevent the risk averse behaviour it was designed to tackle, indicating that further improvements to the scheme were necessary to help farmers maximise the opportunities available to them. A number of engineered measures have also been implemented to reduce exposure to flooding, some of which acted to increase exposure to drought and could be construed as maladaptive in this context.

Within the case study sites, socially differentiated groups demonstrated differing abilities to map their resources on to mobility endowments and thence to entitlements. For example, households living in poverty, with high numbers of young children or elderly and infirm members appeared less mobile. This is the result of lower levels of resources and an institutional environment that made the conversion of these limited resources into mobility endowments and entitlements difficult. In addition, other less visible (and immediately obvious) groups such as households with state employees and those with members already working away also demonstrated less ability to map mobility endowments on to mobility entitlements although their level of resources may

be considerably greater than some of the other types of previously mentioned households.

Linking these insights on mobility to the adaptation practices evident in the case study sites, mobility was an important feature. Generally speaking, those groups demonstrating greater abilities to map their resources on to mobility endowments and thence to mobility entitlements tended to utilise a different portfolio of adaptive responses compared to those households with lower levels of mobility entitlements (excluding the emergency evacuation of Wanzhuang). Specifically, the households with greater levels of mobility entitlements more often reported selling assets and taking up new livelihood activities (labouring for others, migrating for work or starting a new activity in the locale). These data indicate that households better able to map their resources on to mobility entitlements have a broader array of adaptation strategies available compared to those households that have less ability to map their resources on to mobility entitlements. For example, the immobile tended to rely on local measures and resources suggesting that their available sources of adaptation and support were more spatially constrained.

In both sites, remittances were an important source of income during the environmental perturbations highlighting an important benefit of family members working in other, unaffected locations. However, the more dispersed family structure, whilst providing certain benefits, is not without cost. In some instances, the presence of more people (labour) within households in the case study sites could have limited the damage to assets (helping with harvesting) and aided the recovery process. Whilst some family members did return to help with the recovery (return migration), this was not an option available to all households. Absent members were either unable (a lack of job security) or did not deem it worthwhile (loss of income or other support available rural family members) to deploy their mobility entitlements to return to their home village. The role of the state in the recovery process was important (particularly in Wanzhuang) and highlighted by migrants as one reason negating the need to return during times of crises. More broadly these findings highlight the changing role of the state and the household in helping people to prepare for and recover from livelihood shocks. In this instance, the state appears to be providing some support that, historically, would have been within the remit of the household.

7.1.3 Are those with greater endowment and entitlement to mobility more resilient to environmental shocks?

At an individual level, mobility was found to influence the specified resilience⁷⁹ to environmental perturbations in a positive way although the relationship was complicated and did not always hold. In general, those with greater mobility endowments and entitlements appeared able to pursue livelihood opportunities outside of the affected area thereby minimising the disruption they experienced. The analysis also demonstrated the value in understanding the links between mobility and resilience between and within households. The use of mobility by one household member might increase the mobility endowment and resilience of other household members but decrease their personal mobility entitlement.

For example, the use of mobility to access additional livelihood opportunities by the household head could increase the mobility endowments and specified resilience of the wife of the household head whilst decreasing her mobility entitlements. Conversely, individuals that relocate (deploy their mobility entitlements) change their risk portfolio entirely depending on the destination and livelihood. Yet, these individuals retain strong connections with their (rural) family as evidenced by the impact of teleconnected shocks such as the death or illness of other family members. In another example, individuals that rely on the state for employment or livelihoods (through welfare payments) have limited mobility entitlement but varying levels of mobility endowment and specified resilience.

The analysis showed the importance of understanding the difference between those who are immobile and with limited mobility endowments and entitlements and those who are immobile on a voluntary basis with greater mobility endowments and entitlements. Drawing out this potential to move is important in understanding resilience and revealing it highlights a key strength of the conceptual approach adopted for this thesis. For those with very constrained mobility entitlements, some individuals, particularly the elderly reliant on state support for the majority of their income, appeared to downwardly modify their preferences showing general resilience⁸⁰ but low levels of wellbeing. In a similar vein, increasing the specified resilience of individuals to a flood or drought does not necessarily result in increasing levels of general resilience or wellbeing. This finding highlights the danger of adopting an undifferentiated perspective on resilience as an uncritical policy position.

⁷⁹ By which I mean the ability to absorb changes, self-organise and adapt in relation to a specific shock or stress, in this case a climatically driven environmental perturbation.

⁸⁰ By which I mean the ability to absorb changes, self-organise and adapt in general without reference to a specific shock or stress.

Focusing on the different types of (im)mobility practiced in the case study sites, there were clear differences in the perception and self-perception of the different household groups. Those households with members practicing shorter-term mobility appeared to do better on a range of self-perceived, externally perceived and independently derived measures. Households practicing this type of mobility may be able to maximise the income from agriculture whilst also exploiting off-farm, spatially dispersed opportunities. This is especially the case when compared to those households with members practicing longer-term mobility who may lose labour and not gain as much in return from the absent household members. For the immobile households, the gap between self-perceived and externally perceived and independently derived measures was the largest of any household group. This difference could be explained through the levels of personal investment (monetary and non-monetary) in the locality and the externally derived measures, reflecting an inability to exploit opportunities brought about through migration. For longer-term migrants (especially), there was also an interesting tension in how they described their village, providing an insight into how they perceive themselves and their place in the world, as well as the perception of them by others. The village was simultaneously conceived of as backward, underdeveloped and of the past as well as idyllic, a place of stability and safety and a place for the future.

At a village level, the resilience to floods and droughts appeared high, with the community taking a number of measures to enhance the capacity of individuals and groups to respond to the perturbations. However, the between-level interactions had created conditions whereby the general resilience of the village appears close to a threshold (for reasons unconnected with climatically driven environmental change). The proposed New Village Redesign and potential relocation threatens the very existence of the village. As part of the proposal there is a moratorium on new building and the renovation of existing stock, reducing the ability of the village to retain its current population and attract new or returning members and investment. The impact of this feedback is to make the prospect of the New Village Redesign more likely due to the decreasing population size of both villages.

The spectre of this New Village Redesign highlights the importance of immobility endowments and entitlements and the rights of people to remain where they are. In this case, the elderly members of the village expressed a strong desire to grow old in their family home in a place they know and feel comfortable in. Yet, the ability of the elderly members to map their immobility endowments on to their immobility entitlements is threatened by state institutions. The issue of choice again comes to the fore as a crucial mediator of, in this case, general resilience for the village population. For some village members, the idea of relocating the village is entirely undesirable but for the

state the converse is true. Whose resilience matters and who decides what a resilient system looks like are clearly normative elements within a resilient framework but often downplayed and hidden in existing work that addresses the more social aspects of resilience within social-ecological systems.

7.2 Reflections on methodology

7.2.1 Sampling

Site selection

A key issue of the study (also discussed in the Chapter 2 and Chapter 3) related to the bounding of the research and the implications this has at a more operational level for site selection. This issue is of particular relevance to this study as I was interested in generating knowledge about the possible impacts of anthropogenic climate change on the mobility of populations and the links this has with resilience. To achieve this aim, I adopted an analogue approach with the intention of exploring the impact of two extreme events and making inferences about potential impacts of climate change in the future. An important requirement of an analogue approach in relation to climate change is that the events under study have the attributes of extreme events in that they are considered, if not beyond normal limits, at least very unusual and likely to engender novel responses. Information about areas affected by large and significant extreme events was available in academic and grey literature suggesting that the identification of suitable case study sites would be possible (IFRC, 2011; Xinhua News Agency, 2011; Zhang, Qingfeng. *et al.*, 2012; Zhang *et al.*, 2010).

The reality on the ground did not match these expectations and it proved very difficult to locate study sites that had been subjected to the types of events that I considered appropriate for the study⁸¹. This was especially the case in light of the processes through which access and approval to conduct research is granted in China, particularly for foreign researchers (see 3.2.2). As a result of these issues, some concessions were made regarding the final choice of case study site and the nature of the extreme events under study. In the case of the flood, I would have preferred an event that occurred within the more recent past rather than in 2007 which was at the limit of what I considered acceptable. In the case of the drought, I would have preferred an event that was biophysically more extreme to permit me to explore potential novel behaviours brought about by an extreme event. The characterisation of the drought (see 3.3.3) is an event within normal bounds and therefore the response is framed through prior lived experience and existing behavioural adaptations.

⁸¹ I visited 13 potential research sites over a period of two months.

The compromises concerning site selection have implications for the reading of the analysis and the inferences that can be made about impact of climate change in the future. Whilst the study does not provide insight into novel behaviours that are likely to be engendered under anthropogenic climate change it does provide insight into near-term events that are likely to become more frequent and the sorts of behaviours actors will draw upon in response (Kniveton *et al.*, 2009). Furthermore, the approach provides insight into ways in which adaptive capacity can be increased thus enhancing resilience (Ford *et al.*, 2010). In light of this point, research that explores climatic perturbations that are at the more extreme ends of the spectrum in terms of severity as well as the impact of the temporal and spatial of clustering of events is an avenue worthy for future investigation. Insights generated through this research, such as the importance of understanding the longer-term perspective that frame migration decisions as well as the crucial nature of institutions in mediating mobility, are likely to be of value for future research in novel contexts.

Sample sizes and missing households

The household survey and subsequent analysis generated small sample sizes (certainly than were envisioned during the research design) especially when the data were disaggregated at a sub-village level. As a result, a number of statistical techniques were simply not viable and the data had to be analysed using more descriptive techniques. I have signposted, throughout the analysis, instances of small sample sizes and viewed the data in a more illustrative fashion rather than representative and made generalisations of a more theoretical nature (Yin, 2011). The two villages used as case study sites have experienced sustained out migration since the mid 1990s. The sample from which I am drawing from is demonstrating, by still being present in the village, a greater preponderance for immobility (whether through choice or otherwise) than those who have left. This inevitably introduces an unavoidable bias into the analysis. At a household level, the research did not capture those households that had left the case study sites in their entirety. The absence of this subgroup presents an incomplete picture of the population in the sending areas. Similarly, the impact of the out-migrants on the receiving areas is also unknown (Bilsborrow *et al.*, 1984).

The limitations outlined above, particularly in relation to the sample groups not included in the research raise some important issues. The missing sub-groups reduce the amount of empirical data available through which the impacts of mobility on resilience (both specified and general) can be interrogated. Such empirical insights would likely contribute to deeper understanding concerning the links between mobility and

resilience. The role of institutions in mediating the movement of those that had already left is only posited and not subject to empirical verification. As such, there is an assumption that the institutions that are important for those that are included in the study were also important for those excluded from the research. Lastly, understandings concerning perceptions of the village, rural and urban China and migrants may not be consistent between the different groups included and excluded in the research.

7.2.2 Cross-cultural research

Temple and Edwards (2002) argue cross-cultural and cross-language research is subject to the triple subjectivity of the interactions between research participant, researcher and the interpreter / research assistant⁸². These three actors shape the nature, content and development of fieldwork through their inter-relationships, subjectivities, biases and perceptions. Of the three actors, the role of the interpreter and / or research assistant is rarely made explicit in terms of how the data were collected, the meaning given to the data and assisting with the translation. This is especially the case for research that is more positivist in nature or less concerned with exploring meaning and interpretation⁸³. Research assistants play a central role in brokering the research and are an ever-present mediator of contact between the researcher and the research participants in cross-language research (Caretta, 2014; Temple *et al.*, 2006; Turner, 2010b).

As the research progressed, through self-reflexivity, I appreciated more and more the vital role of the research assistant (and other members of the research team) in the co-production of the research and sought to include them in the design and analysis of the research (Tebboth, 2014). Such steps included working collaboratively in the design and implementation of research instruments, formal and informal discussions following activities in the field and group discussions about the insights that were generated as well as future lines of enquiry. Despite these efforts, I feel that the research could and should have been more explicit about the various roles played by the different actors and their positionalities in their methodological reflections. The greater incorporation of insights from the research assistant and other members of the research team (in terms of the written output but also including the ongoing conduct of the research in the field including what as seen as data) would serve to enhance the study's validity and trustworthiness (Caretta, 2014; Thøgersen and Heimer, 2006; Thunø, 2006; Turner, 2010b).

⁸² For this research, one person often performed the dual role of interpreter and research assistant. For the remainder of this section, whilst I use the term 'research assistant', I also mean interpreter.

⁸³ There is a much larger body of work in the more qualitative and interpretivist social sciences that discusses the role of the researcher and research assistant in the co-production of knowledge upon which this section draws.

Leading on from the discussion above, a crucial element of the research relates to meanings and inferences and how accurately these are conveyed from the native language to English. Throughout the research process I sought to manage this issue through a number of measures and checks (discussed in section 3.2.3). For example, the household survey was back translated to identify possible issues with specific terms and interview data were translated through a two stage process to help check for accuracy. However, additional issues emerged through the data analyses that were not foreseen in the design and implementation of specific research methods.

In analysing responses to questions concerning the impact of the climatic perturbations, issues with the question concerning the length of time respondents took to recover financially were apparent. Some respondents appear to have interpreted this question very narrowly and only considered the income derived from government sources (such as the minimum living guarantee) whereas others may have interpreted the question more broadly. These differences in interpretation have, undoubtedly, influenced the analysis and highlight some of the benefits of conducting mixed methods research through which one can use multiple sources of data to interrogate the findings. In this case, interview data with households in the rural case study sites provided invaluable insight to help assess and understand responses to the question on financial impact.

7.3 Contribution to knowledge

7.3.1 Research implications: migration

Drivers of migration

This research critically engages with the issue of population movements and environmental change through the use of analogues to explore current behaviours under conditions of drought and flood. Individual and household responses to climatically driven environmental perturbations were multi-faceted and drew on different adaptive portfolios determined by the characteristics of the individual or household. Within these different responses, a minority of households⁸⁴ used mobility, in the form of shorter-term, more cyclical migration, longer-term migration, and return migration as well as reducing the number of dependents. The perceived reasons given for the different types of mobility evident in the case study sites differed; the environment was accorded less weight for longer-term migration compared to shorter-term migration for example. At a more abstract level, traditional institutional barriers were more often cited as important in influencing decisions concerning migration. In short, different drivers have different degrees of importance depending on the type of

⁸⁴ The majority of residents of Wanzhuang were also evacuated but that form of migration was imposed on the village as a whole and is considered as distinct from the other forms of mobility.

mobility used; this insight has important methodological implications for migration research.

The impact of (actual and perceived) environmental change is felt primarily on agriculture and the associated disruption to livelihoods. Other impacts were also reported on health and general levels of wellbeing (for both case study sites) and on the physical assets and the general disruption associated with loss of livelihoods during the evacuation (for Wanzhuang specifically). Indirect impacts of environmental change were evident in certain behaviours that arose due to the perception of risk and exposure to flooding (for both sites). In addition, there were also knock on effects for other household members not directly affected by the environmental perturbation. For example, parents or other relatives were required to look after children who could not be cared for by their grandparents during the flood. The Foresight Report (2011) highlights how environmental change impacts directly on livelihoods but also indirectly on other drivers of migration and Kniveton *et al.* (2012) assert that relationships between the environment and migration are likely to be non-linear. This research supports the conclusions from the Foresight Report (*ibid*) and Kniveton *et al.* (*ibid*) in highlighting the potential role of teleconnections on migrants and their families as a specific type of indirect driver of migration that could lead to non-linear behaviour (see, also, Sakdapolrak *et al.*, 2013).

Placing the environment in migration

The role of the environment was often not considered crucial by the majority of respondents as a factor influencing migration. This suggests that there is a need to be cautious in how much importance one ascribes to environmental issues compared to the more pressing needs and constraints (as well as opportunities) people experience on a day-to-day basis. In China, as in many other developing countries, the speed of change is phenomenal. Economic and social development as well as political and cultural change may be more pronounced, certainly in the short term, than variations in environmental conditions driven by anthropogenic climate change. Shocks and stresses to lives and livelihoods that result from climatically driven environmental change (directly and indirectly) represents one grouping of a myriad potential shocks and stresses (Bonfiglio, 2012; Castles, 2011). The environment and change to the environment must be viewed through a prism of everyday needs, wants and desires that constitute people's lives (Etzold *et al.*, 2013; Findlay, 2012; Gray and Mueller, 2012). The danger of reifying the environment, as a driver of change must be avoided in research that explores both contemporaneous events and that which looks to the future.

Institutions are very important in mediating who has mobility endowments and can use their mobility entitlements and this has great significance for future mobility patterns. Whilst environmental conditions do and will impact on mobility, the relationship is mediated by a number of intervening institutions (both formal and informal) (Black, 2011; Foresight, 2011). At a formal level, the power of the state in China is noticeable and, a significant (intended and sometimes unintended) driver (one of many) of (im)mobility (Chan, 2010a; Fan, 2004; Zhang, 2008). This highlights the importance of the existing institutional arrangements as influencing mobility and, in this case, the ongoing relationship between the state and its citizens (Leach *et al.*, 1999; Nguyen and Locke, 2014). In the near term, a variety of institutional issues are likely to outweigh the impact of changing environmental conditions. Understanding these institutional drivers may offer a possible avenue to utilise and harness (im)mobility and moderate some of the effects of anthropogenic climate change.

Mobility, immobility and choice

Mobility begets mobility and those who are or have been mobile show increased tendency to use mobility in response to environmental shocks and stresses, supporting similar conclusions in previous studies (Bakewell, 2007; Morrissey, 2009). This suggests that existing characteristics will continue to provide useful insight into who is likely to be mobile in the future. Mobility endowments and entitlements are also shown to be important in enabling individuals and households to access a greater range of livelihood opportunities, supporting the view of migration as a viable and important adaptive strategy (Black *et al.*, 2011b; Gómez, 2013; McLeman and Hunter, 2010; Tacoli, 2009). These opportunities would not be available if migration were not possible, highlighting the important links between migration and development (Deshingkar, 2005; Deshingkar, 2006; Sutherland, 2013).

However, the presumption that people will be mobile and need to be mobile to get on in life also masks the rights of some to be sedentary (particularly in rural areas). Expectations on younger household members to leave are so strong that it may be overriding their individual preferences highlighting an inability to determine their own future and influence the structures around them. For the elderly, place attachment to their home and village is strong; many enjoy living and want to grow old in a place they know and are familiar with. Conceptualising this desire through immobility endowments and immobility entitlements and interrogating the processes through which these are utilised or undermined brings to the fore some of the important social institutions that mediate these processes (Etzold *et al.*, 2012). The New Village Redesign clearly represents a state institution that inhibits immobility whilst the stretching of livelihoods

across multiple locations describes a process whereby households are able to remain in rural locations whilst exploiting opportunities present in more urbanised locations.

The issue of choice is an important consideration in understanding mobility. At one end of the spectrum some people are immobile through choice, whilst, at the other end, some are immobile because they have no other option. The same applies to mobility; some people chose to use mobility in a proactive sense whilst others are more obliged to use mobility as other options are constrained (Foresight, 2011; Warner and Afifi, 2013). Mobility and immobility and elected and obliged should be conceived of as spectrums and not simple dichotomies. Individuals will be subjected to degrees of choice and degrees of compulsion. An interesting thread emerging from the analysis explores the spectrum of (im)mobility and the degree to which it is obliged or elected, providing important empirical grist to recent theoretical developments (Adger *et al.*, 2014; Black *et al.*, 2013; Foresight, 2011; Gómez, 2013) and highlighting the need for research that tackles the agency structure dialectic head on (Obokata *et al.*, 2014).

One of the major contributions of this thesis is to the emerging literature on immobility. Interest in the issue of immobility has increased of late with the growing realisation that environmental change will result in immobility as well as mobility (Black *et al.*, 2013). Despite this interest, the issue of immobility still remains under researched and under theorised (Foresight, 2011). The theoretical framework and analysis presented in this thesis goes some way to addressing this gap in knowledge and provides one possible approach through which the issue of immobility can be explored. For example, this research has generated insights concerning the importance of social difference, the role of the state and that of individual agency in addition to environmental change as key factors influencing immobility. Furthermore, the research has also provided some tentative insights concerning links between immobility and adaptation responses. Findlay (2011), in his recent paper on migrant destinations in an era of environmental change, suggested a more productive focus for research would be on issues such as immobility (rather than numerical estimates of environmental migrants for example). I endorse that call and argue that immobility should be an important focus for research now and in the future. More insight and understanding is required that explores how and why immobility occurs and, crucially, what the implications of this immobility are on individuals, families and communities.

7.3.2 Research implications: resilience

Relationship between mobility and resilience

Mobility can modify resilience in a number of ways. As mentioned above, current or historical mobility within a household appears to afford increased use of additional livelihood options as an adaptive strategy. For others, the use of mobility completely changes the risk portfolio and exposure to different types of environmental change. This indicates that mobility can and should be understood, in certain circumstances as a form of adaptation or transformation (Brown and Westaway, 2011; Coulthard, 2012). There are strong connections between and within different levels of analysis as demonstrated by the impacts of individual mobility on other members of the same household unit or the feedbacks created by the proposed New Village Redesign. Underpinning much of this debate concerns the role of context and the complex dynamics between agency and structure. Understanding and pulling apart the different structural issues and their interaction with agency remains a key issue and one that requires considerable further theorising and empirical work in the field of migration research (Bakewell, 2010; McLaughlin and Dietz, 2008).

Accessible spaces

The majority of shocks and stresses brought about by environmental change are location specific. Understanding people's potential to respond and adapt to shocks and stresses through the idea of accessible space offers potential for novel insight in relation to resilience that implicitly embeds the issue of mobility in its broadest sense (Sheller and Urry, 2006; Urry, 2000; Urry, 2007). Simply put, I posit that there is a relationship between the accessible space an individual, household, or community possesses and the spatial extent of the livelihood disruption such that those individuals, households, or communities with access to larger accessible spaces will be more resilient to environmental shocks and stresses. The corollary is that those individuals, households, or communities with smaller accessible spaces are less resilient as they have a more constrained portfolio of responses available to them to cope with the impact of the shock or stress.

In this context, I consider accessible space to be spaces within which individuals, households, or communities are able to derive some sort of benefit (for example areas that offer a wider range of livelihood opportunities or proximity to an ancestor's shrine). Within this notion of accessible space two concepts are crucial and warrant further explanation. First, the research findings show that mobility is socially structured and certain socially differentiated groups are more privileged than others. Pushing this line of reasoning forward implies that certain spaces are also more accessible to some

(socially differentiated groups of) people but not others. For example, individuals with an urban *Hukou* will be able to access and derive more benefits from urban areas compared to those with a rural *Hukou* (Fan, 2002). Space, conceptualised as more or less accessible, permits an exploration of the political and institutional processes that privilege certain (socially differentiated) groups over others in determining who has access to which spaces. Second, within the notion of space I embed the idea of an ability to derive a benefit. The ability to derive a benefit is important as it emphasises the importance of the type of space and not just space per se. Benefit is defined beyond purely economic terms to include other aspects such as social and psychological wellbeing. Different spaces will be more or less important depending on the type of benefit derived (economic, social, or psychological for example).

Consider this example. For those who are more mobile or have greater potential to be mobile, a greater array of opportunities will be available to exploit in other physical locations unaffected by the climatically driven environmental change, as demonstrated by this and other research (Agrawal and Perrin., 2009; Goulden *et al.*, 2009). At a social level, more contacts and better networks in other areas suggests that, if required, information and opportunities would be easier to come by compared to those with more limited social networks (Cassidy and Barnes, 2012). Furthermore, those networks are less likely to be affected directly by the shock or stress. At a psychological level, an ability to create a space, to imagine oneself living and flourishing in other locations or to be subject to social pressures to move are important (Chan, 2012; Kates *et al.*, 2012).

Attempts to understand place-specific environmental risks need to engage with the reality of complex translocal householding and ways in which households utilise and derive benefits from different spaces (Collyer and King, 2014; Harvey, 1989; Lefebvre, 1991; Nguyen and Locke, 2014). In doing so, it is important to understand the position of these households and not to fixate on the risk in the rural place in isolation but to engage with the complex management of risks across different spaces. The ability of households to derive benefits and utilise all of the spaces potentially available to them are critical to that household in adapting to the place specific rural risk.

Critical engagement with adoption of resilience as an (uncritical) policy position

This research argues that notions of resilience and wellbeing are not always mutually beneficial and calls for a more critical appreciation and understanding of the relationship between the two concepts. For example, individuals and households that were living in conditions of poverty appeared to be adapting down their preferences or limiting their expectations, demonstrating resilience but not wellbeing (Coulthard, 2012).

Similarly, increasing resilience brought about through mobility did appear, in some instances, to decrease wellbeing for other individuals within the same household. These examples highlight the fallacy of assuming that greater resilience leads to increased levels of wellbeing (a similar point was made by Béné *et al.*, (2012) in regard to increased resilience not necessarily leading to a reduction in poverty).

The increasing popularity and currency of resilience in policy and development circles raises the real danger that it is adopted uncritically, as an assumed good thing (Armitage *et al.*, 2012). This is clearly not the case, resilience can be 'bad' as much as it can be 'good' and needs to be employed in a way that furthers developmental objectives and not as a standalone development objective (Béné *et al.*, 2014). Within academic circles resilience is often portrayed as purely descriptive with no normative element (Leach, M., 2008). I argue that resilience, when applied to social systems, is unavoidably normative. Decisions about how the system is framed, who determines what is considered resilient or otherwise, notions of intentionality within system transformations, the privileging of certain viewpoints and ways of imagining the future give lie to the idea of resilience as a purely descriptive concept. Appreciating the normative elements of resilience reinforce the caution that needs to be exercised in appropriating it for developmental goals if issues of exclusion and marginalisation (for example) are to be avoided.

7.3.3 Research implications: methodology

Interrogating different levels of analysis and their interactions is very important and provides added depth to the research. The strengths of a resilience lens, in understanding the processes that impact upon mobility and the contribution of mobility to resilience, are drawn out through an exploration of the feedbacks and synergies evident in the analysis. More generally, the study highlights the importance of critically interrogating the role and linked nature of different actors within a household unit. Many studies on migration tend to adopt the household as the lowest unit of analysis. Within the households, individuals operate and exert agency constrained by the norms and expectations of the family unit and wider social structures. The behaviour of one actor must be seen in the context of its impacts on other actors within the same household unit, highlighting the importance of research that attempts to critically engage with different levels of (social) analysis (see, also, Gray and Mueller, 2012 for research engaging more explicitly with levels of the household and the community).

Different schemas are used to rationalise and understand decisions to migrate depending on the type of migration practiced. Research that explores the drivers of migration and the reasons why people move needs to be much more accurate in

teasing out the origins of the response generated. This research has indicated that people provide a different set of responses concerning reasons for moving depending on whether the respondent was thinking about an instance where the move was short-term, long-term or in general (without reference to an actual event in their or life or that of a household member). Future research studies should acknowledge and be more explicit in recognising the likely difference in explanations that arise from the way in which a question is framed and the context in which the answer is provided. For example, is the respondent recalling a specific migration event in their own life, that of the household or talking about migration in general? What is the nature of the migration event being discussed: is it of a longer-term or shorter-term nature? This research suggests that these different questions will engender different answers and highlight the importance of carefully constructing questions to ensure they consistently capture the desired information. This insight may also help to explain some of the variation and contradictory findings present in existing studies.

7.3.4 Policy implications

China has experienced a huge increase in levels of population mobility over the past quarter of a century and this trend shows no sign of decreasing. Yet, just under half of the population are still classed as rural and reliant on agriculture. Agriculture in China sustains 22 per cent of the global population with only 7 per cent of the world's arable land and is one of the most important sectors of the economy contributing 11 per cent to Gross Domestic Product (GDP) in 2009 (Li *et al.*, 2011). China's weather is highly variable and the country experiences frequent and devastating extreme events such as floods and droughts. The prevalence of extreme events has increased: droughts have occurred more frequently in the North and North East and floods in the middle and lower reaches of the Yangtze region and South China have become more severe (NDRC, 2007: 5). Under climate change, extreme events are predicted to become more common (Field, C. B. *et al.*, 2012) although the overall impact on agriculture is thought to be neutral or slightly positive. The interplay of an increasingly mobile population (Peng, 2011), a high dependence on agriculture and a challenging and changing climate future (Li *et al.*, 2011) as well as increasing pressure on land and water resources highlight some of the pressures China is facing.

Strong progress has been made in China around the issue of climate change. The knowledge of the likely biophysical impacts of climate change and associated implications this has for socio-economic systems has increased dramatically in recent years. The 12th Five Year Plan makes climate change mitigation a priority and has also identified adaptation as a key area of work. In November 2013, at the Conference of

the Parties in Warsaw, China launched its first national adaptation strategy (CMA, 2013). Key priorities identified in the National Strategy of Climate Change Adaptation include agriculture, water resources and human health. Additionally, the Strategy requires national and provincial governments to develop sector, provincial and local adaptation plans that will shift China's response from strategy to implementation. Managing this shift, from strategic priorities to implementation, effectively is critical to ensure that the appropriate adaptation measures are identified and implemented.

This research highlights the well-adapted nature of the rural communities under study despite significant levels of poverty and the important contributory role of mobility. In moving from the more strategic priorities to implementation of adaptation plans the importance of mobility needs to be acknowledged and the benefits it brings fostered. Efforts need to be made to maximise the potential for mobility to benefit rural areas and ensure that the poverty reduction in more urban areas is translated into improvements in less-developed rural areas (Barnett and Webber, 2010; Richter, 2013). On a related note, managing and planning for the current and future movement of people is also an important goal in its own right (Black *et al.*, 2013). The provision of and access to services in rural areas compared to urban areas is unequal and the same applies for the provision and access when comparing migrants and non-migrants in urban areas. Providing more equal access and better provision of services in rural areas as well as for migrants in urban areas is important (Appave and Laczko, 2005; Biao, 2007a; Biao, 2007b).

Developing rural areas and the agricultural sector specifically to ensure that they are able to respond to an increasingly variable climate in the future is critical for continued poverty reduction, increasing levels of rural development as well as farming. The implications of the continued depopulation of the countryside on farming productivity and the ability of China to maintain or increase the levels of production in staple crops to achieve self-sufficiency are uncertain in light of the continuing depopulation of rural areas as Taylor *et al* (2003: 75) observe. This study shows that farmers can and do adapt to changes in local conditions and this ability needs to be fostered through, for example, the provision of better extension services as well as more investment in rural areas.

This research questioned the viability of the village to survive into the future (whether it be as a result of state policies, continued out migration, or demographic change). Many children of farmers working in cities are increasingly removed from farming and rural lifestyles and do not see a future in rural locations (Connelly *et al.*, 2011). If this pattern is replicated in other parts of rural China then the obvious question to pose is: who will

be the farmers of the future? The unknown intentions of the rural migrants are a crucial issue for rural families, the migrants themselves and China as a whole (Yang, Z., 2013). The existing policy environment and any future policy innovations need to ensure that the rural communities and the farming sector is supported (such as the abolition of agricultural tax) rather than undermined (Norse *et al.*, 2010; OECD, 2009).

Carter *et al.* (2012) argue that reform of land tenure is necessary to facilitate the expansion of average farm sizes and realise greater efficiencies thus helping to support and encourage a new generation of farmers. Yet, it is too simplistic just to call for reform without an appreciation of what that means on the ground, for whom and how it is likely to be implemented. Reforms are political with winners and losers. The impact of the proposed New Village Redesign project on the inhabitants of Wanzhuang and Dongdian shows that there are consequences and these consequences are not neutral. I argue that change is necessary for rural China but the country (the government and its citizens) as a whole needs to envision what this means and how best to get there.

7.4 Concluding remarks

The thesis sought to place (im)mobility more centrally within a resilience framing. Through the framework and analysis I have been able to explore some of the opportunities and barriers that help or hinder the ability of socially differentiated actors to map resources on to (im)mobility endowments and (im)mobility entitlements. In so doing, I have explored the complex links between mobility and resilience and have also been able to draw out some of the more normative elements of resilience that are often hidden (Brown, 2014; Davoudi *et al.*, 2012). The advantages of resilience framings are widely acknowledged but care is required when moving from theory to praxis in social environments and delivering interventions on the ground.

China, and Asia more generally, is in the midst of a remarkable transformation that has led some commentators to label this as the Asian Century (Asian Development Bank, 2011). This research has focused on some of challenges China faces in microcosm: an urbanising and aging population, climate change, the necessity of agricultural reform, large disparities between urban and rural areas and between migrants and non-migrants. These issues represent huge challenges for the country and watching China navigate them will be fascinating in the coming years.

8 Appendices

Appendix 1: Respondent pseudonyms used in the text and their identifiers

Appendix 2: Questionnaire

Appendix 3: Methodology used to develop the indices used in the analytical chapters

Appendix 4: Chinese economic, social, political and cultural context

Appendix 5: Selective, comparative economic data by prefecture for Anhui Province

Appendix 6: Chinese climate context and impacts on agriculture

Appendix 1

A1: Respondent pseudonyms used in the text and their identifiers

Pseudonym	Gender	Village respondent associated with	Identifier	Interview location
Pan Tong-Mu	M	Dongdian	DMI1	Dongdian
Pan Hao	M	Dongdian	DMI2	Shanghai
Pan Li	M	Dongdian	DMI3	Shanghai
Pan Hua	F	Dongdian	DDI1	Dongdian
Pan Lijuan	F	Dongdian	DDI2	Dongdian
Pan Xiong	M	Dongdian	DDI3	Dongdian
Pan Hong	M	Dongdian	DDI4	Dongdian
Pan Ji	M	Dongdian	DDI5	Dongdian
Pan Yao	M	Dongdian	DDI6	Dongdian
Wang Bing	M	Wanzhuang	WMI1	Shanghai
Wang Dao	M	Wanzhuang	WMI2	Shanghai
Wang Meiyong	F	Wanzhuang	WMI3	Shanghai
Wang Bao-Zhi	M	Wanzhuang	WZI1	Wanzhuang
Wang Zhou	M	Wanzhuang	WZI2	Wanzhuang
Wang Hong-Li	M	Wanzhuang	WZI3	Wanzhuang
Wang Chung	M	Wanzhuang	WZI4	Wanzhuang
Wang Dewei	M	Wanzhuang	WZI5	Wanzhuang

Appendix 2

A2-1: Household survey questionnaire (for drought case study) in English

X: Interview metadata

Cover Sheet

UEA

Fudan Tyndall Centre for Climate Change Research

FUDAN

HOUSEHOLD LIVELIHOODS SURVEY FORMS

Introduction

You are being invited to take part in a research project that explores links between migration and changing environmental conditions.

This research will explore how and if people use migration respond to events such as droughts and floods.

A research team at Fudan University is carrying out the research with help from students at Hefei University of Technology.

We will use the information from our study to learn about the impacts of the weather on rural lives and some of the problems facing communities like yours.

We would like to ask you some questions about your family and your families activities.

We will also be asking about some of the problems that have faced your household this year and in the past.

All information we collect will be treated confidentially. Your names and personal details will not be used in the study's report or in any information which might be made available to anyone else.

Are you able and willing to spend some time with us to answer these questions?

E1A: Respondent given informed consent form and project information sheet Tick

E1B: Respondent provided informed consent Tick

X Interview details

X1: Village Name

E2: Date of Interview

X2: Household Code

E3: Time of interview

X3A: Ethnicity

E4: Name of Interviewer

X3B: Religion
Enter NR for no response

E5: QA present Yes No part
(circle)

X4: Household head name
Family name and first name

X5: Contact phone number

Instructions

1. Household code should be of the form Ax, where A = village name (D for Dongdian, W for Wanzhuang) and x = household number (1 to 100)
3. If there is not enough space on a particular page then insert an extra copy of the form for the additional information.
4. Adult is defined as 16 years and over; a child as under 16 (unless they are household head or spouse).

Incomplete

Complete

Completed Forms Quality Checked by interviewer: *initial*

Quality assured by *initial*

Translated by: *initial*

Quality assured by *initial*

Coding added (in red): *initial*

Data entered into spreadsheet: *initial*

Section X; Page 1 of 16

Mark Tebboth

Questionnaire V3.1.xlsx

Perception of change in weather and its impact on people

This section focuses on changes in the weather and the effects of any changes on your household

A101: Have you observed any changes in rainfall over the last 20 years? CODE

 1: Yes 2: No *If 'Yes', record notes here*

A102: Have you observed any changes in temperature over the last 20 years? CODE

 1: Yes 2: No *If 'Yes', record notes here*

<p>A103: Have you experienced more droughts or dry spells in this area over the last 20 years? CODE <input style="width: 40px; height: 20px; border: 1px solid black;" type="text"/> 1: Yes, a lot more 2: Yes, more 3: About the same as before 4: No, less than before 5: No, a lot less than before 6: Did not exist before 99: Don't know</p>	<p>A104: Have you experienced more floods or wet spells in this area over the last 20 years? CODE <input style="width: 40px; height: 20px; border: 1px solid black;" type="text"/> 1: Yes, a lot more 2: Yes, more 3: About the same as before 4: No, less than before 5: No, a lot less than before 6: Did not exist before 99: Don't know</p>
--	--

A105: Have you experienced changes in other extreme weather events in this area over the last 20 years **[don't prompt with examples]**? CODE

 1: Yes, a lot more 2: Yes, more 3: About the same as before 4: No, less than before 5: No, a lot less than before 6: Did not exist before 99: Don't know *Specify the events*

A106: Does the changing weather that you have described affect agricultural production? CODE

 1: Yes, a lot 2: Yes, but only a little 3: No, not really 99: Don't know *If 'Yes', explain*

A: Environmental extremes

A2: Impact of drought

Household code: _____

This section focuses specifically on the drought or dry spell that occurred in summer 2011 and its impacts.

Check the respondent recalls the drought through the filter Question C201. If the respondent can recall the drought ask the remaining questions in this section. If the respondent cannot recall the drought move to the next section.

A201: Can you recall the drought that occurred in 2011 in this area?
1: Yes 2: No

CODE

If 'Yes', please briefly describe your memories of the event

Impact of the drought on agriculture

A202A: Did the drought affect your crops (sown or harvested)?
1: Yes 2: No

CODE

If the answer to question A202A is 'No'; skip questions A202B to A202C

A202B: Which sown (young and mature) crops did the drought affect and, if any, what proportion was lost (in percent)?
1: Wheat 2: Corn 3: Soya 4: Vegetables 5: Other (specify) 88: N/A

CODE	Describe how affected	%

Input code, description and percentage loss

A202C: Which harvested crops did the drought affect and, if any, what proportion was lost (in percent)?
1: Wheat 2: Corn 3: Soya 4: Vegetables 5: Other (specify) 88: N/A

CODE	Describe how affected	%

Input code, description and percentage loss

A203A: How much of your land was used for farming at the time of the drought?
Insert figure in MU

MU

A203B: Of this, what proportion was affected by the drought?
Provide a figure in percent

%

A204: Compared to a normal year did you change your farming inputs during the drought event?

CODE	Input	More	Less	Same
1	Fertilizer			
2	Pesticides			
3	Irrigation			
4	Seeds			
5	Different crops			
6	Labour			

Tick which column applies for each input

Other impacts of the drought

A205: Describe the most serious damage to your physical assets that occurred as a result of the drought?

1: Your house 2: Items in your house 3: Farming equipment 4: Transport (bikes, motorbikes, cars etc.) 5: Other (specify) 6: None

CODE	Description

A206A: Did the drought decrease the availability of food in your household?

1: Yes, a lot less 2: Yes, a little less 3: No

CODE

A207A: Did the drought make the health of any members of your household worse?

1: Yes, a lot 2: Yes, a little 3: No

CODE

A207B: If yes, the health of how many household members was affected?

NUMBER

A208A: As a result of the drought were you in a worse position financially?

1: Yes 2: No

CODE

A208B: If yes, how long did it take you to get back to your pre-drought financial position?

CODE

1: Less than 3 months 2: Between 3 and 6 months 3: Between 6 months and a year 4: Between 1 and 2 years 5: Longer than 2 years 6: Haven't recovered 99: Don't know

A209: Overall, did the drought adversely affect the wellbeing your household?

1: Yes, a lot 2: Yes, a little 3: No

CODE

A210A: Did anyone provide advice during or after the drought about what to do or how to cope?

1: Yes, family members 2: Yes, Neighbours 3: Yes, Village elders or leaders 4: Yes, government officials 5: Yes, others (specify) 6: No

CODE

Notes or is '5' selected

If the answer to question A210A is 'Yes'; ask question A210B; otherwise move straight to section A3 overleaf

A210B: What sort of advice did they provide?

1: Advice about coping with the immediate effects 2: Advice about how to recover once the drought has finished 3: Advice about measures to help avoid or cope with droughts in the future 4: Other (specify)

CODE

Notes or is '4' selected

Coping with the flood or drought

A301A: Which of the following actions did your household take in response to the flood / drought [use either flood or drought depending on location]?

Please indicate using form below

CODE	Action <i>* specify what borrowed/ given</i>	Taken	Details of action taken <i>Note when it occurred (e.g. during or immediately after the extreme event) and whether it is still continuing now and any other relevant features</i>
		1 = Yes 0 = No	
1	Selling assets (crops, physical assets etc.)		
2	Offering labour to others		
3	Borrowing money or food*		
4	Purchasing more food from market		
5	Seeking help/gifts from other people*		
6	Seeking help or aid from any organisations or groups		
7	Reducing household expenditure		
8	Starting a new livelihood activity		
9	Reducing number of dependents (e.g. children or elderly)		
10	Household member moving away to seek work		
11	Claiming agricultural insurance or government compensation		
12	Other (specify)		

A302: As a result of the flood or drought [use either flood or drought depending on location] have you bought agricultural insurance?

1: Yes 2: No

CODE

If 'Yes', specify

A303A: Does your household currently receive money from absent household members

1: Yes 2: No

CODE

If the answer is 'No'; ask question A303B. If the answer is 'Yes' skip to question A303C

A303B: Has your household ever received money from absent household members (migrants)?

1: Yes 2: No

CODE

If the answer is 'Yes' ask question A303C. If the answer is 'No'; skip question A303C.

A303C: Did your household receive any money from absent household members (migrants) to cope with the flood or drought [use either flood or drought depending on location]?

1: Yes 2: No

CODE

B: Migration

B1: Migrants decisions / networks

Household code: _____

Migration and networks

B101: During or as a result of the flood or drought [use either flood or drought depending on location] have any of the following changes in movements occurred in your household?

Please indicate using form below

Action	Taken 1: Yes 0: No	Details of action taken	By whom
		Note when it occurred (e.g. during or immediately after the extreme event), whether it is still continuing now and any other relevant features	Code using Annex 1 or input 111 for 'Whole family' or 99 for 'Don't know'
Family members living in your household during the extreme event			
Temporary relocation out of village during the extreme event			
Increase in the amount of time people are spending out of the village (e.g. from 1 or 2 days a month to 3 or 4 days)			
Decrease in the amount of time people are spending out of the village (e.g. from 3 or 4 days a month to 1 or 2 days)			
Increase in the number of times that people are leaving the village (e.g. 0 days a week to 1 day a week or 1 day a month to 3 or 4 days a month)			
Decrease in the number of times that people are leaving the village (e.g. 1 day a week to 0 days a week or 3 or 4 days a month to 1 day a month)			
Changes to longer term migration out of the village (increase or decrease for example)			
Household or family members living outside of your village during the extreme event			
Increase in one-off, unplanned return migration to help cope with the effects of the extreme event			
Increase in the amount of time people are spending in the village (e.g. from 1 or 2 day a month to 3 or 4 days)			
Decrease in the amount of time people are spending in the village (e.g. from 3 or 4 days a month to 1 or 2 days)			
Increase in the number of times that people are returning to the village (e.g. 0 days a week to 1 day a week or 1 day a month to 3 or 4 days a month)			
Decrease in the number of times that people are returning to the village (e.g. 1 day a week to 0 days a week or 3 or 4 days a month to 1 day a month)			
Changes to longer term migration into the village (increase or decrease for example)			

B102: How important were your extended family, friends and other contacts in helping you to cope with and recover from the flood or drought [use either flood or drought depending

1: Very important 2: Important 3: Not very important 4: Not important 88: N/A

CODE	Description	Type of support provided	Note down details below
	Immediate family		
	Extended family		
	Friends / neighbours		
	Other contacts		

B: Migration
Migration and networks (cont.)

B1: Migrants decisions / networks

Household code: _____

B103: Has anyone in your household ever migrated or moved away, even for a short period of time, for any reason? CODE

1: Yes 2: No

If yes ask the remaining questions in this section. If no, move straight to Section C, page 9

B103A: In your household who is involved in making migration decisions? CODE

1: Males 2: Females 3: Both 4: Other (specify)

Record any notes here or if '4' selected

B103B: Who, in general takes the final decision? CODE

1: Head of household (male/female)
 2: Migrant 3: Other (specify)

Record any notes here or if '3' selected

B104A: If a member of family is going to migrate whom would you talk to get more information?

CODE	Description	TICK
1	Friends	<input type="checkbox"/>
2	Neighbours	<input type="checkbox"/>
3	Village elders	<input type="checkbox"/>
4	Extended family	<input type="checkbox"/>
5	Contacts not in local area	<input type="checkbox"/>
6	Other (Specify)	<input type="checkbox"/>

Specify who here

Space to record any notes for question B304A

B104B: When talking to the people you have indicated above (B104A), what sort of information would you be interested in finding out [prompt with cost of migrating or working conditions]?

Record notes here

B105: Has anyone in your house-hold ever considered moving but, in the end, decided not to [probe for different family members]? If yes, explain why. CODE

1: Yes 2: No

Record notes here

Migration and networks (cont.)

B106: Which of these factors were important in migration decisions that your household made (see annex 2)?

INSERT MULTIPLE CODES AS REQUIRED

B107: Are the following issues a taken into account when your household makes a decision about migration?

CODE	Issue	PLEASE TICK	
		Yes	No
1	Access to state subsidised education		
2	Access to state subsidised health care		
3	Maintaining your claim on your land		
4	Hukou registration		

B108: What positive impacts has migration had on your family **[don't prompt]**?

Record notes here

B109: What negative impacts has migration had on your family **[don't prompt]**?

Record notes here

C: Household and its members

C1: Household roster

Household code: _____

Information about household members

List all household members by name. Fill in the table for all of the people who are usually living in the household (include all members whether they are registered or unregistered). For those who are not registered a qualifying period of 3 months stay (or intention to stay) should be used to discount short-term visitors. For the purposes of this question a household is defined as those who usually reside and eat together (under one roof). Children are classified as under 16 years of age. For all children complete questions A102 to A106 (marked by a **) unless they are the household head or spouse of the household head in which case all details should be collected.

ID	Name**	Age**	Sex**	Relation-ship to H/H head**	Place of birth**	Hukou status*	Literate / illiterate	Education Level Reached	Years of schooling	Health issues*	Current status	Type of work
C101	C102	C103	C104	C105	C106	C107	C108A	C108B	C109C	C110	C111	C112
	Family and fore name Circle who is providing the information	Try to get an approximate value if exact age is not known	1 = M 2 = F	For coding see annex 1	1: Within this county / town area 2: Not in this county / town area but within province 3: Another province 99: Don't know	1: Agricultural 2: Non-agricultural 3: Local 4: Non-local 99: Don't know	1: Literate 2: Illiterate 99: Don't know	1: No schooling 2: Primary 3: Junior middle 4: Senior high 5: Vocational 6: University or college 7: Other 99: Don't know	Total years of completed schooling 88: N/A 99: Don't know	Suffer from any serious health issues 1: Mental disability (e.g. depression, dementia or addictions) 2: Physical disability 3: Chronic illness (long lasting or permanent illness, e.g. epilepsy) 4: No 99: Don't know	1: Work (pay, profit, family gain) 2: Household or childcare 3: Unemployed / idling 4: Studying 5: Sick / disabled 6: Other 99: Don't know	1: Family farm 2: Individual or family business 3: Private sector employee 4: Gov't employee 5: SOE employee 6: Other 88: N/A 99: Don't know
A1	NAME	YEAR	CODE	CODE	CODE	CODE	CODE	CODE	YEARS	CODE	CODE	CODE
A2												
A3												
A4												
A5												
A6												

If more than 6 members of the household, continue on a second form
 Enter code, amount in numbers or short description
 * use multiple codes if necessary
 ** only details that should be sought about children

C: Household and its members

C2: Migration

Household code: _____

In- and return migration

Applies to adults (registered or unregistered) who are currently living in the household (stay of at least 3 months).

In-migrants: not born in this location (see response to C106) and moved into the household within the last 10 years.

Return migrants: have lived away from the village (more than 3 months) when they were older than 12 years and returned within the last 10 years.

C201: Have any of the household members you have just told me about moved into or returned to the village within the last 10 years? CODE

If yes complete the table below. If no please move straight to question C206

1: Yes 2: No

XXX	C202		C203	C204		C205
ID	Time since arrival / return		Residence prior to here	Main reason for moving / returning		Participating in answering
Use ID from C101	How long since he/she returned (use most recent if returned more than once). Try to get an approximate value if exact duration is not known Enter '99' if not known		Be specific; include province, city, county, town and village if possible / applicable Enter '99' if not known	For coding see annex 2 Enter up to five reasons, include brief description if necessary		Insert ID from C101 and circle main informant
	YEAR	MONTH	LOCATION	CODES AND DESCRIPTION (IF NECESSARY)		CODE

If more than 4 members of the HH, continue on a second form

Shorter term out migration

C206: Have any adult members of your household (usual resident of 3 months or more) been away for more than one week but less than 3 months in the last year? CODE

If yes complete the table below. If no please move straight to question C102, page 11

1: Yes 2: No

XXX	C207	C208	C209		C205
ID	Frequency of departure	Length of stay	Main reasons for leaving		Participating in answering
Use ID from C101	How many times a year are they away 1: Annually 2: Seasonally 3: Monthly 4: Weekly 5: Other 99: Don't know	How long will they stay away 1: Less than two weeks 2: 2 weeks to 1 month 3: More than 1 month and less than 3 months 99: Don't know	For coding see annex 2 Enter up to five reasons, include brief description if necessary		Insert ID from C101 and circle main informant
	CODE	LOCATION	CODES AND DESCRIPTION (IF NECESSARY)		CODE

If more than 4 members of the HH, continue on a second form

C: Household and its members

C2: Migration

Household code: _____

Absent household members

Fill in the table for all adults (over 16 years of age) who are registered as living at the household but have left and for people who were a usual, but unregistered, resident of the household and have left during the last 5 years. For those who have left recently a minimum period of 3 months absence from the household or an intended absence of at least 3 months away should be used to discount short-term trips to family for example. Do not complete the table for those that have left but since returned, other questions relate to this group of people.

C210	C102	C103	C104	C105	C211	C212	C213	C214A	C214B	C108A	C108B	C108C
ID	Name**	Age**	Sex**	Relation-ship to H/H head**	Age at leaving	Time since move	Expected duration away	Current marital status	Date of event	Literate / illiterate	Education Level Reached	Years of schooling
	Enter family and fore name	In complete years. Try to get on approximate	1 = M 2 = F	For coding see annex 1	Age at leaving in years. If the exact age is unknown try to get on approximate age	Length of time since move in years and months. Try to get on approximate value if exact duration is not known	Length of time person expected to stay away in years from today.	1: Married 2: Remarried 3: Divorced 4: Widowed 5: Not Married 1: Enter years 2: Permanent 99: Don't know	Date that the most recent relationship event occurred (see previous column)	1: Literate 2: Illiterate 99: Don't know	1: No schooling 2: Primary 3: Junior middle 4: Senior high 5: Vocational 6: University or college 7: Other (specify)	Total years of completed schooling
		Enter '99' if not known			Enter '99' if not known	Enter '99' if not known	99: Don't know	Enter '88' if N/A	Enter '99' if not known		Enter '88' if N/A	Enter '99' if not known
B1		YEAR	CODE	CODE	YEAR	YEAR	YEAR	YEAR	YEAR	CODE	CODE	YEARS
B2						MONTH						
B3												
B4												
B5												
B6												

If more than 6 members of the household, continue on a second form

Enter code, amount in numbers or short description

** only details that should be sought about children

C: Household and its members

(continued from previous page)

C2: Migration

Household code: _____

XXX	C215	C216A	C216B	C216C	C111	Only ask questions				
ID	Reasons for leaving	Current destination	Type of place	First place moved to	Current status	C217A	C217A	C217C	C205	
Use ID from C301	For coding see annex 2 Enter up to five reasons	Location of current place of usual residence (stay of 3 months or more) after leaving	1: City 2: Town 3: Village 4: Other (specify) 99: Don't know	1: Yes 2: No 99: Don't know	1: Work (pay, profit, family gain) 2: Housework or childcare 3: Unemployed / idling 4: Studying 5: Sick / disabled 7: Other 99: Don't know	Current or last job if unemployed	Current or last job if unemployed	State average weekly or monthly income for current or last job if unemployed	Insert ID from C101 and circle main informant if more than 1 respondent	
CODE	LOCATION	CODE	CODE	CODE	CODE	CODE	CODE	INCOME	CODE	
B1										
B2										
B3										
B4										
B5										
B6										

If more than 6 members of the HH, continue on a second form

Enter code, amount in numbers or short description

C311: Please provide contact details (including phone number) of your family members that have migrated to Shanghai

--

State that they should only provide contact details if they are willing for us to contact the person for whom they have provided details

Agricultural assets

The information should refer to the most recent 12 months (from July 2012 to June 2013).

Field ID	Area	Ownership	Use of land*	Use of produce	Cropping frequency	Quality of land	Irrigation in winter growing season	Cultivated by*
XXX	C301	C302	C303	C304	C305	C306	C307	C308
	<i>Include all areas such as personal vegetable plots and non-productive land</i>	1: Privately owned 2: Rented with money 3: Rented without money 4: Communally owned 5: Other 99: Don't know	1: Crops (specify) 2: Vegetables 3: Pasture (specify) 4: Forest 5: Not planted 6: Used by other household 7: Other (specify) 99: Don't know	1: Subsistence 2: Cash 3: Mixed 4: Other 88: N/A 99: Don't know	1: Single 2: Double 3: Other 88: N/A 99: Don't know	1: High 2: Medium 3: Low	% of plot irrigated and source of irrigation 1: Well 2: Pond 3: Irrigation channel 4: River 5: Other 88: N/A 99: Don't know	1: Men in h/h 2: Women in h/h 3: Children in h/h 4: All h/h 5: Paid labour 88: N/A 99: Don't know
A	MU	CODE	CODE	CODE	CODE	CODE	%	SOURCE
B								
C								
D								
E								

If more than 5 plots, continue on a second form

**use multiple codes where necessary*

C309: Do you own any livestock?

1: Yes 2: No

CODE

If yes, specify what and number owned

C310: Do you do any other farm-related activities (fishing or forestry for example)?

1: Yes 2: No

CODE

If yes, specify

Changing circumstances over time

C310A: Compared to 5 years ago have your crop yields changed?

CODE

If response to C310A is '1' or '2' ask question C310B. If response is '3' skip to question C311

1: Increased 2: Decreased 3: Stayed the same 4: Not comparable as different crop planted

C310B: If yields have changed, please specify the reasons for the change?

Record response here

C311: How dependent are you and your household on agriculture for your livelihoods?

CODE

1: Completely dependent 2: Dependent 3: Not that dependent 4: Not dependent at all

C312A: Compared to 5 years ago do you think your households wellbeing has got better, stayed the same or got worse?

CODE

Only ask C312B if response to question C312A is '1' or '2'. If response is '3' move to question C313

1: Got better 2: Got worse 3: Stayed the same

C312B: If getting better or worse please specify reasons for change **[don't prompt]**?

Record response here

C313A: Compared to 5 years ago do you think your financial position has changed?

CODE

Only ask C313B if response to question C313A is '1' or '2'. If response is '3', move to question C314

1: Got better 2: Got worse 3: Stayed the same

C313B: If getting better or worse please specify reasons for change **[don't prompt]**?

Record response here

C: Household and its members

C3: Assets and livelihoods

Household code: _____

Household assets

C314: How many bedrooms does your household have?

NUMBER

Record any notes here _____

C315: What are your household's main sources of power for cooking, heating, lighting and water heating?

1: Electricity 2: Wood 3: Charcoal 4: Gas
5: Other (specify)

Used for	CODE
Cooking	
Heating	
Lighting	
Water heating	

Insert code and description if necessary

C315: Which, and how many, of the following do you own?

Item	Description	No. Owned
A	Ceiling fan	
B	Colour TV	
C	Refrigerator	
D	Washing machine	
E	Computer	

Item	Description	No. Owned
F	Water heater	
G	Bicycle	
H	Motorbike or 3 wheeled scooter - electric or petrol	
I	Car / pick up / jeep etc.	

C316: Including this house, how many houses do you own?

NUMBER

C317: Do you have any savings or loans?

CODE

If yes for loans, specify why it was taken out? _____

1: Yes, savings 2: Yes, loans 3: Yes, both 4: No

Specify details here

Bring the interview to a close and thank the participant for their time.

Ask if they have any questions about the research.

Leave open the possibility that we may need to contact them again in the future.

Before leaving quickly check through the questionnaire to make sure that you haven't missed anything out. Once you have left check through the questionnaire in a bit more detail: if there is anything you have missed this is your chance to go back and get the information

Space to record any personal observations about the interview and the respondent. For example if you feel the interview went well or respondent was particularly talkative and honest note this down. Alternatively, if the respondent may have seemed quite closed and you feel he / she didn't provide honest answers record this

Annex 1: Relationship codes for household members

Identify each household member in relation to the head. To use the table read down column A (in bold) for members related directly to the household head and then, if necessary, across for other relations. E.g. to identify the son of the household head's 2nd brother read down column A to number 42 (the brother) and then across to number 62 in Column C (the son).

		Relationship to other persons in the household					
		A	B	C	D	E	
		Head	Wife / Husband	Son / daughter	Brother / sister	Father / mother	
Relationship to head of household	Head	01	-	-	-	-	
	Wife / Husband	02	-	-	72	82	
	Son / daughter	1 st	11	21	31	-	-
		2 nd	12	22	32	-	-
		3 rd	13	23	33	-	-
		4 th	14	24	34	-	-
		5 th or more	15	25	35	-	-
	Brother / sister	1 st	41	51	61	-	-
		2 nd	42	52	62	-	-
		3 rd	43	53	63	-	-
		4 th	44	54	64	-	-
		5 th or more	45	55	65	-	-
	Father / mother	81	83	-	84	85	
	Other relations	86	-	-	-	-	
	Unrelated persons	87	-	-	-	-	

Examples:

- 1.) Code 11 means the person is the 1st son or daughter of the household head
- 2.) Code 21 means the person is a wife (or husband) of the 1st son (or daughter) of the household head
- 3.) Code 84 means the person is a brother (or sister) of the father (or mother) of the household head

Annex 2: Codes for migration decisions

Show or read this Annex to participants when instructed by the questionnaire survey (question B106). Questions C204, C209 C213 require that you identify up to five most important reasons from the list based on the response from the the participant

Social / Institutional

A1	Poor education provision locally / better education provision elsewhere
A2	Poor health care provision locally / better health care provision elsewhere
A3	Family and friends were too far away / to be near family and friends
A4	Personal family reasons (specify)
A5	Hukou registration
A6	Maintain family claim on land
A7	Provision of services (such as education or health care) is cheaper
A8	Proposal by the government to relocate villages: the 'New village' project
A9	Restriction on building new homes locally
A10	Access government funded social support schemes

Personal

B1	Marriage
B2	Moved for a specific job
B3	Neighbours better off (wealthier, had more things etc)
B4	Better job opportunities / ability to earn more money elsewhere
B5	Potential to build a better live elsewhere
B6	Saw the benefits migration in other households

Economics / work

C1	Low incomes locally
C2	Unemployment
C3	Poor working conditions
C4	Not enough land for farming
C5	Dissatisfaction with livelihood
C6	Inability to earn good money through agriculture

Natural surroundings

D1	Poor environmental quality (rural or urban)
D2	Droughts
D3	Floods
D4	Unreliable harvest
D5	Heavy rainfall events
D6	Periods of hot weather
D7	Insect plagues

Other

E1	Other (please describe)
----	-------------------------

A2-2: Household survey questionnaire (for drought case study) in Chinese

X: Interview metadata Cover Sheet
 UEA Fudan Tyndall Centre for Climate Change Research FUDAN
HOUSEHOLD LIVELIHOODS SURVEY FORMS

Introduction

You are being invited to take part in a research project that explores links between migration and changing environmental conditions.

This research will explore how and if people use migration respond to events such as droughts and floods.

A research team at Fudan University is carrying out the research with help from students at Hefei University of Technology.

We will use the information from our study to learn about the impacts of the weather on rural lives and some of the problems facing communities like yours.

We would like to ask you some questions about your family and your families activities.

We will also be asking about some of the problems that have faced your household this year and in the past.

All information we collect will be treated confidentially. Your names and personal details will not be used in the study's report or in any information which might be made available to anyone else.

Are you able and willing to spend some time with us to answer these questions?

E1A: Respondent given informed consent form and project information sheet Tick

E1B: Respondent provided informed consent Tick

X Interview details

X1: Village Name

E2: Date of Interview

X2: Household Code

E3: Time of interview

X3A: Ethnicity

E4: Name of Interviewer

X3B: Religion
Enter NR for no response

E5: QA present Yes No part
(circle)

X4: Household head name
Family name and first name

X5: Contact phone number

Instructions

- Household code should be of the form Ax, where A = village name (D for Dongdian, W for Wanzhuang) and x = household number (1 to 100)
- If there is not enough space on a particular page then insert an extra copy of the form for the additional information.
- Adult is defined as 16 years and over; a child as under 16 (unless they are household head or spouse).

Incomplete Complete

Completed Forms Quality Checked by interviewer: initial

Quality assured by initial

Translated by: initial

Quality assured by initial

Coding added (in red): initial

Data entered into spreadsheet: initial

A: 极端环境事件

A1: 认识和影响

家庭户编码: _____

天气变化的感知及其影响

这部分主要关注天气变化以及它对您家的影响

A101: 您是否感觉到近20年来降雨有所变化?

1: 是 2: 否

如果回答“是”，记录相关的描述

A102: 您是感觉到近20年来气温有所变化?

1: 是 2: 否

如果回答“是”，记录相关的描述

A103: 比起以前，近20年来您是否经历更多的旱灾或干旱期?

1:是，比以前多得多 2:是，比以前多一些 3:跟以前差不多 4:没有，比以前少一些 5:没有，比以前少得多 6:以前没有出现过干旱 99:不清楚

A104: 比起以前，近20年来您是否经历更多的洪涝或降雨期?

1:是，比以前多得多 2:是，比以前多一些 3:跟以前差不多 4:没有，比以前少一些 5:没有，比以前少得多 6:以前没有出现过干旱 99:不清楚

A105: 近20年来，您这儿是否发生过其他极端天气? (不要举例，让对象自由回答)

1:是，比以前多得多 2:是，比以前多一些 3:跟以前差不多 4:没有，比以前少一些 5:没有，比以前少得多 6:以前没有出现过干旱 99:不清楚

请给予具体描述

A106:您所说的这些天气变化是否影响到了您的收成?

1:是，影响很大 2:是，只有一点点影响 3:不，没什么影响 99:不清楚

如果“是”，请具体解释一下

A: 极端环境事件

A2: 旱灾的影响

家庭户编码: _____

这部分具体关注2011年夏季的旱灾及其影响。

请通过问题A201确认对方是否记得此次旱灾。如果对方能够回忆, 请完成这部分的其他问题。如果对方不能回忆, 请跳过这部分的其他问题进入下一个部分。

答案

A201: 您能否回忆起2011年村里的旱灾?

1: 能 2: 不能

如果“能”, 请简单描述一下当时的情况

旱灾对农业的影响

答案

A202A: 旱灾是否影响到您的庄稼 (包括种在地里的和已收割的)?

1: 是 2: 否

如果回答“否”, 跳过A202B和A202C

A202B: 当时的旱灾影响到了哪些还在地里的庄稼 (包括未熟和已熟的)? 各种庄稼的损失多大 (%) ?

1: 小麦 2: 玉米 3: 黄豆 4: 蔬菜 5: 其他 (说明)
88: 不详

号码	描述如何影响	%

请填写入号码, 文字描述和损失百分比

A202C: 当时的旱灾影响到了哪些已收割的庄稼? 每种庄稼的损失多大 (%) ?

1: 小麦 2: 玉米 3: 黄豆 4: 蔬菜 5: 其他 (说明)
88: 不详

号码	描述如何影响	%

Input code, description and percentage loss

A203A: 发生水灾的时候, 您有多少地用于农业种植?

填写土地面积 (单位亩)

亩

A203B: 您用于农业种植的土地中, 有多少受旱灾影响?

填写百分比

%

A204: 与正常年份相比, 在有旱灾的年份, 您在农业上的投入是否有所变化?

号码	投入	更多	更少	一样
1	肥料			
2	农药			
3	灌溉			
4	原作物的种子			
5	其他作物			
6	劳动			

对每种投入进行“打钩”判断

A: 极端环境事件

A2: 旱灾的影响

家庭户编码: _____

旱灾的其他影响

A205: 请描述一下在这次旱灾中, 您受到的最严重的损失是?

1:您的房子 2:您家的生活用品 3:农业用具和机械 4:交通工具(包括自行车、摩托车、电瓶车、汽车等) 5:其他(说明) 6:没有受损

号码	描述

答案

A206A: 旱灾是否减少了您家的食物供应?

1: 是, 少了很多 2: 是, 少了一点 3: 没有影响

答案

A207A: 这次旱灾是否使您家人的身体状况变差了?

1:是, 明显变差 2:是, 只受一点影响 3:没有影响

A207B: 如果“是”, 您家几个人身体受到影响?

数字

答案

A208A: 旱灾是否使您的经济状况变差了?

1: 是 2: 否

A208B: 如果“是”, 多久之后您的经济状况才恢复到旱灾之前的水平?

答案

1:不到3个月 2:3个月到半年左右 3:半年到一年左右 4:一到两年左右 5:超过两年 6:到现在还没有恢复 99:不清楚

A209: 总的来说, 旱灾是否使您家生活水平降低了?

1:是, 降低很多 2: 是, 降低一点 3: 没有影响

答案

答案

A210A: 旱灾发生时和发生后, 是否有人给您提供应对旱灾的建议?

1:有, 家人 2:有, 邻居 3:有, 村里的老人和领导 4:有, 政府官员 5:有, 其他(说明) 6:没有

如果选择“5”, 请记录相关信息

如果A210A的答案是“有”, 请回答A210B。否则, 请跳至A3。

答案

A210B: 他们提供了哪些建议?

1:如何应对干旱早期出现的征兆 2:如何进行灾后恢复 3:如何应对将来的旱灾 4:其他(说明)

如果选择“4”, 请记录相关信息

应对水灾或者旱灾

A301A: 为应对水灾或旱灾, 您家采取了一下哪些措施? (询问水/旱灾依地点而定)

请用下表进行表述

序号	措施 * 若3和5的答案是1, 请具体描述	是否 1= 是 0= 否	措施采取的具体情况 注明何时采取(灾情发生时还是之后立刻采取), 现在是否还在采用, 以及其他相关信息
1	变卖资产(庄稼、物质资产等)		
2	替别人干活(包括有偿和无偿)		
3	是否向别人借钱或者食物*		
4	从市场上购买更多的食物		
5	向其他人寻求帮助或馈赠*		
6	向组织机构或者群体寻求帮助		
7	减少家庭开支		
8	开始其他新的谋生方式		
9	由其他亲戚朋友负责照顾老人、小孩和病人		
10	家庭成员外出找工作		
11	请求支付农业保险金或政府损失赔偿		
12	其他(说明)		

A302: 您是否由于遭受水灾或者旱灾(询问水/旱灾依地点而定)而去购买农业保险?
1: 是 2: 否

答案

如果“是”, 请具体说明

A303A: 您家现在是否收到外出家庭成员给的钱?
1: 是 2: 否

答案

如果“不是”, 请回答A303B。如果“是”, 请回答A303C。

A303B: 您家是否曾经收到外出家庭成员给的钱?
1: 是 2: 否

答案

如果“是”, 请回答A303C。如果“不是”, 请跳过A303C。

A303C: 外出家庭成员是否给家里寄钱以帮助家人应对水灾/旱灾(询问水/旱灾依地点而定)?
1: 是 2: 否

答案

B: 人口迁移

B1: 移民的决策过程及其关系网络

家庭户编码: _____

迁移和关系网络

B101: 在水灾或旱灾发生时或者由于灾情的原因（询问水/旱灾依地点而定）您家是否出现以下几种人口迁移或流动的情况

请用下表进行描述

行为	出现 1: 是 0: 否	具体情况	采取者
		注明何时采取（灾情发生时还是之后立刻采取），现在是否还在采用，以及其他相关信息	
以下问题针对灾害发生时在住的家庭成员			
水灾/旱灾时，暂时离开村庄			
延长了呆在村外的时间（例如，先前每个月1-2天不在村内变为每个月3-4天不在村内）			
缩短了呆在村外的时间（例如，先前每个月3-4天不在村内变为每个月1-2天不在村内）			
增加了离开村子的次数（例如，先前每周没有外出变为每周外出1次；或者先前每月外出1次变为每月3-4次）			
减少了离开村子的次数（例如，先前每周外出1次变为每周没有外出；或者先前每月外出3-4次变为每月1次）			
长期外出的情况出现了变化（可能是增加、减少、或者出现）			
以下问题针对灾害发生时不在家的成员			
在外成员一次性的，事先未计划地回家以帮助应对灾害，这种情况出现或者增加了			
增加了他们在家的时间（例如原先每月1-2天在家变为每月3-4天在家）			
减少了他们在家的时间（例如原先每月3-4天在家变为每月1-2天在家）			
他们回家的次数增加了（例如原先不在家变为每周回家1次，原先每月外出1次变为3-4次）			
他们回家的次数减少了（例如原先每周回家1次变为每周不会家，原先每月外出3-4次变为1次）			
长期迁移的情况出现了变化（可能是增加，减少或者出现）			

B102: 在应对水灾/旱灾或者灾后恢复上，您的亲戚、朋友以及其他熟人的作用？（询问水/旱灾依地点而定）

1: 他们的作用非常重要 2: 比较重要 3: 不怎么重要
4: 一点也不重要 88: 不详

号码	描述	帮助、支持的程度	记录详细信息
	直系家庭（父母、配偶、兄弟姐妹、子女）		
	扩展家庭（祖父母、叔婶、表亲）		
	朋友/邻居		
	其他熟人		

B: 人口迁移
迁移和关系网络

B1: 移民的决策过程及其关系网络

家庭户编码: _____

B103: 您的家庭成员中是否有或曾经有长期外出或短期外出的情况 (不管出于何种原因)?

答案

1: 有 2: 没有

如果“有”，请继续回答；如果“没有”，直接进入C部分的问题。

B103A: 在决定是否出去 (只要是离开村子) 时, 哪些人参与讨论?

答案

1: 家中的男性 2: 女性 3: 两者都有 4: 其他 (说明)

如果选择“4”，请记录相关信息

B103B: 一般来说, 谁最后说了算?

答案

1: 家长(男性/女性) 2: 外出者本人
3: 其他 (说明)

如果选择“3”，请记录相关信息

B104A: 如果您家中有人想要出去 (只要是离开村子), 一般向谁询问相关信息?

序号	询问对象	打钩
1	朋友	<input type="checkbox"/>
2	邻居	<input type="checkbox"/>
3	村里的老人	<input type="checkbox"/>
4	亲戚	<input type="checkbox"/>
5	在外的熟人	<input type="checkbox"/>
6	其他 (说明)	<input type="checkbox"/>

如果选择“6”，请记录相关信息

如果选择“6”，请记录相关信息

B104B: 当询问上述您说的人时, 会向他咨询哪些信息? (可给予适当提示, 如工作条件, 迁移花费等等)

请在此处记录相关信息

B105: 您家里是否有人曾经想出去但结果却没有出去的? (可询问其各家庭成员) 如果“有”, 为什么呢?

答案

1: 是 2: 没有

请在此处记录相关信息

B: 人口迁移
迁移和关系网络

B1: 移民的决策过程及其关系网络

家庭户编码: _____

填入数字, 可多选

B106: 在决定是否出去时 (只要是离开村子), 您家比较关注以下哪些因素 (详见 annex 2)?

--

请打钩

B107: 在决定是否出去 (只要是离开村子) 时, 您家是否会考虑以下问题?

序号	问题	是	否
1	本地的教育会有政府补贴		
2	本地看病会有国家补贴		
3	村里还有您的地		
4	户口		

B108: 外出 (只要是离开村子) 给您家带来了哪些好的影响? (不要提示对方)

请在此处记录相关信息

B109: 外出 (只要是离开村子) 给您家带来了哪些不好的影响? (不要提示对方)

请在此处记录相关信息

C: 家庭成员信息

C1: 家庭相关信息

家庭户编码: _____

家庭成员信息

请在表中记录常住家庭成员的信息，不管户口是否在当地，常住指居住超过三个月，或者居住不满三个月，但打算住三个月以上。本表意在调查那些长期在这所房子中共同生活的家庭成员。这里“孩子”定义为16周岁以下人口。对于“孩子”，需要完成A102到A106的问题（有**标出的问题）；如果他们不是户主或者户主的配偶，需要填写全部信息。

	C101	C102	C103	C104	C105	C106	C107	C108A	C108B	C109C	C110	C111	C112
	ID	姓名**	年龄**	性别**	与户主的关系**	出生地**	户口*	识字/不识字	已获得的 教育程度	教育年限	健康状况*	目前状态	工作类型
		填写全名 请“圈出”回答问题的成员	请尽量填写确切的年龄，否则也请给予近似的年龄 如果不知道请填写“99”	1 = 男 2 = 女	编号参见 Annex 1	1: 本县 2: 非本县但本省 3: 外省 99: 不知道	1: 农业 2: 非农业 3: 本村 4: 外村 99: 不知道	1: 识字 2: 不识字 99: 不知道	1: 未上过学 2: 小学 3: 初中 4: 高中 5: 中职 6: 大学或大专 7: 其他 99: 不知道	总共上过几年学 88: 不适用 99: 不知道	1: 精神疾病 (如抑郁症, 痴呆等) 2: 身体残疾 3: 慢性疾病 (长期性) 或永久性的疾病, 如哮喘, 心血管疾病 4: 没有疾病 99: 不知道	1: 种地或打工 2: 持家或照顾孩子 3: 失业/闲散无事 4: 学习 5: 生病/残疾 6: 其他 99: 不知道	1: 在家种田 2: 自己做生意或家庭生意 3: 替私人打工 4: 政府部门职工 5: 国有企业职工 6: 其他 88: 不适用 99: 不知道
A1	姓名		年龄	性别	性别	性别	性别	性别	性别	年龄	性别	性别	性别
A2													
A3													
A4													
A5													
A6													

如果超过6人，请在第二张表格中填写
请填写入号码、数字或文字

*如果需要，可以多选
**孩子必须填写的信息

迁入与回迁

适用于常住成年的家庭成员（“常住”的定义见上一页）。迁入移民：非本地出生（参见C106）以及近10年内才迁入该家庭的人口。返乡移民：12岁以后离乡外出（三个月以上）以及近十年内迁回本地的人口。

C201: 在您刚才提到的家庭成员中，是否有任何人是在过去 选项 回答“是”请完成下表。回答“否”请直接
从C206开始回答
1: 是 2: 否

XXX	C202	C203	C204	C205
ID	到达/返乡时间	上一个居住地	迁移/返乡的主要原因	参与回答
Use ID from C101	他/她返乡多久（如多次返乡以最近一次返乡时间为准）。如果无法告知具体时间，请告知大致时间 不知道请填写'99'	请具体说明：可能的话请告知具体的省、市、县、镇和村 不知道请填写'99'	代码请参见附录2 请最多填写五个原因，可能的话请做简单描述	注明C101问题中的身份ID，例如A1和/或A4
	年 月	地点	代码和描述（非必填）	代码

家庭成员超过4个请另附表1

短期外出

C206: 在过去的一年内，您的家庭是否有任何成年人（通常居住时间在3个月以上）曾经离开家一周以上，三个月 选项 回答“是”请完成下表。回答“否”请直接从11
以下？
1: 是 2: 否

XXX	C207	C208	C209	C205
ID	外出频率	外出时长	外出的主要原因	参与回答
Use ID from C101	他们每年外出几次 1: 每年都外出 2: 每季度都外出 3: 每月都外出 4: 每周都外出 5: 其他 99: 不确定	每次外出多长时间 1: 两周以下 2: 两周至一个月 3: 1个月以上，3个月以下 99: 不确定	代码请参见附录2 请最多告知五个原因，可能的话请做简单描述	注明C101问题中的身份ID，例如A1和/或A4
	编码	地点	编码和描述（非必填）	编码

家庭成员超过4个请另附表格

C: 家庭户与家庭成员

C2: 迁移

家庭编号: _____

家庭外出成员

请填写所有家庭成员 (16 岁以上), 包括 (1) 过去五年内本家庭户籍外出超过 3 个月人员; (2) 过去五年内常住本户, 但没有当地户口, 现在已经有三个月不在本户居住; (3) 近期外出未超过三个月, 但打算外出三个月以上。不包括曾外出但已返乡成员。

C210	C102	C103	C104	C105	C211	C212	C213	C214A	C214B	C108A	C108B	C108C
ID	姓名**	年龄**	性别**	家庭成员与户主的关系**	外出年龄 如不知道具体年龄 请告知大概年龄	离家时长 离开家多长时间了	预计外出时间 预计从今天算起 起会在外停留多长时间	婚姻状况 1: 已婚 2: 未婚 3: 离异 4: 丧偶 5: 单身 99: 不适用	事件日期 最近一次相关事件发生日期 (参见上一列)	识字/不识字 1: 非文盲 2: 文盲 99: 不确定	文化程度 1: 未上学 2: 小学 3: 初中 4: 高中 5: 职业技术学院 6: 大学本(专)科 7: 其他 (请具体说明) 88: 不适用 99: 不确定	受教育年限 总共上学时间
	请填写姓名	实际年龄, 如不知道具体年龄 请告知大概年龄	1 = 男 2 = 女	代码参见附录 1	外出年龄 如不知道具体年龄 请告知大概年龄	离开家多长时间了	1: 请填写具体停留时间 2: 未定 99: 不确定	1: 已婚 2: 未婚 3: 离异 4: 丧偶 5: 单身 99: 不适用	最近一次相关事件发生日期 (参见上一列)	1: 非文盲 2: 文盲 99: 不确定	1: 未上学 2: 小学 3: 初中 4: 高中 5: 职业技术学院 6: 大学本(专)科 7: 其他 (请具体说明) 88: 不适用 99: 不确定	总共上学时间
B1		不确定请填写 99			不确定请填写 99	不确定请填写 99			不确定请填写 99			不确定请填写 99
B2												
B3												
B4												
B5												
B6												

家庭成员超过 6 人, 请另附表格
填入选项, 包括数字和简要描述

**孩子必须填写的信。

C: 家庭户与家庭成员

C2: 迁移

家庭编号: _____

(接上页)

XXX	C215	C216A	C216B	C216C	C111	C217A	C217B	C217C	C205
Use ID C301	外迁原因 2 最多填写五个原因	迁移后常住地 (原住3个月或以上)	居住地行政级别 1: 市 2: 镇 3: 村 4: 其他 (请具体说明) 99: 不确定	是否首次迁移 1: 是 2: 否 99: 不确定	当前状况 1: 种地或打工 2: 家务或照顾小孩 3: 失业/待业 4: 学习 5: 生病/残疾 6: 退休 7: 其他 99: 不确定	工作类型 当前工作 (假如失业, 请填写上一份工作) 1: 家庭农场 2: 家族企业 3: 个体户/雇工 4: 公务员 5: SOE 6: 合伙人 7: 其他 99: 不确定	如何找到工作的 当前工作 (失业请填写上一份工作) 1: 政府分配 2: 家人/亲戚介绍 3: 熟人介绍 4: 自己找 5: 其他 (请具体说明) 99: 不确定	平均收入 当前工作的平均月薪或月薪 (失业请填写上一份工作) 1: 月薪 2: 周薪 不确定请填写 "99"	参与回答 注明C101问题中的身份ID, 例如A1和/A4
		请具体说明: 可能的话请具体到省、市、县、镇和村							
B1									
B2									
B3									
B4									
B5									
B6									

家庭成员超过6人, 请另附表格

填入选项, 包括数字和简要描述

C311: 如您有任何的家庭成员迁移到上海, 请提供他们的联系方式 (包括电话号码)

--

说明: 如果在上海的家庭成员愿意接受我们, 请提供他们的联系方式。如果您觉得不便, 您可以不提供该项信息。

C: 家庭户与家庭成员

C3: 资产与生计

家庭编号: _____

农业资产

请在下表中填写本家庭所有土地的相关情况（包括家庭所有和家庭无所有权但有使用权的土地）。请确定下表中已包含所有土地，目前在使用的或是自家菜地等也请列出，下列信息请以最近12个月为准（自2012年7月到2013年6月）。

Field ID	C301 面积	C302 土地使用权	C303 土地用途*	C304 生产目的	C305 种植频率	C306 土地质量	C307 冬季生长季节灌溉	C308 耕种者*
	所拥有的全部土地面积（包括已开发土地、非生产性用地等）	1: 自有 2: 租赁（需付租金） 3: 租借（不付租金） 4: 集体所有 5: 其他 99: 不确定	1: 农作物（请具体说明种类） 2: 蔬菜 3: 畜牧（请具体说明） 4: 林地 5: 未种植 6: 家庭用作其他用途 7: 其他（请具体说明） 99: 不确定	1: 家庭消费 2: 出售 3: 自己消费，部分 4: 其他 88: 不适用 99: 不清楚	1: 单季 2: 双季 3: 其他 88: 不适用 99: 不清楚	1: 高 2: 一般 3: 低	灌溉比率（%）和水源 1: 井水 2: 池塘 3: 灌溉 4: 河水 5: 其他 88: 不适用 99: 不确定	1: 家庭成员中的男性 2: 家庭成员中的女性 3: 16岁以下家庭成员 4: 所有家庭成员 5: 雇请劳动力 88: 不适用 99: 不确定
A	亩	选项	选项	选项	选项	选项	%	水源池
B								
C								
D								
E								

超过5类土地，请另加表格

*必要时可填多个选项

C309: 你是否饲养家畜?

1: 是 2: 否

编码

回答‘是’，请具体说明家畜种类和数量

编码

C310: 您是否从事其他与农业相关的生产活动（如渔业或林业）?

1: 是 2: 否

回答‘是’，请具体说明。

家庭环境变化状况

C310A: 与5年前相比, 您的农作物产量是否发生变化?

选项

1: 增加 2: 减少 3: 没有变化 4: 不同作物间不具可比性

回答'1'或'2'则继续回答C310B. 回答'3'则直接跳至C311C

C310B: 假如产量变化, 请具体说明变化原因?

在此记录答案。

C311: 您和您家人的生活在多大程度上依靠务农所得?

选项

1: 完全依靠 2: 部分依靠 3: 不十分依靠 4: 完全不依靠

C312A: 与5年前相比, 您认为您家庭的生活状况是变好还是变差?

选项

1: 变得更好 2: 变得更差 3: 没有变化

回答'1'或'2'则继续回答C312B, 回答'3'则直接跳至C313

C312B: 如果您的生活变得更好/更差, 请具体说明让您生活状况改变的原因 (请调查员注意不要给予任何提示)?

在此记录回答内容

C313A: 与5年前相比, 您是否觉得您的经济状况有所变化?

选项

1: 变得更好 2: 变得更差 3: 没有变化

回答'1'或'2'则继续回答C313B, 回答'3'则直接跳至C314

C313B: 如果您的经济状况变得更好/更差, 请具体说明使您经济状况发生变化的原因 (请调查员注意不要给予任何提示)?

在此记录回答内容

C314: 您家现在有几间睡房?

数量

在此进行备注

C315: 您家里做饭、取暖、照明和烧水等使用的主要能源是什么?
1: 电 2: 柴火 3: 煤 4: 天然气
5: 其他 (请说明)

用途	选项
做饭	
取暖	
照明	
烧水	

如有需要可加入其他选项或进行具体说明

C315: 您家有下列哪些物品? 每样有几个?

种类	物品描述	拥有数量
A	电风扇	
B	彩电	
C	冰箱	
D	洗衣机	
E	电脑	

种类	物品描述	拥有数量
F	热水器	
G	自行车	
H	摩托车或三轮摩托 (电/汽油)	
I	小汽车 / 货车 / 吉普车等	

C316: 包括现有住房在内, 您一共有多少间房子?

数量

C317: 您是否有存款或贷款?

编号

1: 有存款 2: 有贷款 3: 都有 4: 都没有

如果有贷款, 请具体说明贷款的目的是什么?

在此记录具体细节

访谈到此结束, 感谢大家的配合和参与。
询问被访对象对该调研是否有任何疑问。
向被访对象说明将来我们有可能需要再次与他们联系。

在离开之前请迅速检查一遍问卷确保没有遗漏之处。离开之后请再次仔细检查, 确认没有任何遗漏: 如有任何遗漏, 请及时返回并进行补充。

此处用于记录访谈员对访谈过程和访谈对象的个人看法。例如，假如访谈员觉得访谈进行顺利，或是访谈对象十分健谈且所答问题的可信度较高，请在此加以说明。相应的，如果访谈者觉得访谈过程中访谈对象话比较少，或是认为他/她所给出的答案存在疑问，也请在此做相关说明。

Annex 1: Relationship codes for household members

Identify each household member in relation to the head. To use the table read down column A (in bold) for members related directly to the household head and then, if necessary, across for other relations. E.g. to identify the son of the household head's 2nd brother read down column A to number 42 (the brother) and then across to number 62 in Column C (the son).

		Relationship to other persons in the household					
		A Head	B Wife / Husband	C Son / daughter	D Brother / sister	E Father / mother	
Relationship to head of household	Head	01	-	-	-	-	
	Wife / Husband	02	-	-	72	82	
	Son / daughter	1 st	11	21	31	-	-
		2 nd	12	22	32	-	-
		3 rd	13	23	33	-	-
		4 th	14	24	34	-	-
		5 th or more	15	25	35	-	-
	Brother / sister	1 st	41	51	61	-	-
		2 nd	42	52	62	-	-
		3 rd	43	53	63	-	-
		4 th	44	54	64	-	-
		5 th or more	45	55	65	-	-
	Father / mother	81	83	-	84	85	
	Other relations	86	-	-	-	-	
	Unrelated persons	87	-	-	-	-	

Examples:

- 1.) Code 11 means the person is the 1st son or daughter of the household head
- 2.) Code 21 means the person is a wife (or husband) of the 1st son (or daughter) of the household head
- 3.) Code 84 means the person is a brother (or sister) of the father (or mother) of the household head

Annex 2: Codes for migration decisions

Show or read this Annex to participants when instructed by the questionnaire survey (question B106). Questions C204, C209 C213 require that you identify up to five most important reasons from the list based on the response from the the participant

Social / Institutional

A1	Poor education provision locally / better education provision elsewhere
A2	Poor health care provision locally / better health care provision elsewhere
A3	Family and friends were too far away / to be near family and friends
A4	Personal family reasons (specify)
A5	Hukou registration
A6	Maintain family claim on land
A7	Provision of services (such as education or health care) is cheaper
A8	Proposal by the government to relocate villages: the 'New village' project
A9	Restriction on building new homes locally
A10	Access government funded social support schemes

Personal

B1	Marriage
B2	Moved for a specific job
B3	Neighbours better off (wealthier, had more things etc)
B4	Better job opportunities / ability to earn more money elsewhere
B5	Potential to build a better live elsewhere
B6	Saw the benefits migration in other households

Economics / work

C1	Low incomes locally
C2	Unemployment
C3	Poor working conditions
C4	Not enough land for farming
C5	Dissatisfaction with livelihood
C6	Inability to earn good money through agriculture

Natural surroundings

D1	Poor environmental quality (rural or urban)
D2	Droughts
D3	Floods
D4	Unreliable harvest
D5	Heavy rainfall events
D6	Periods of hot weather
D7	Insect plagues

Other

E1	Other (please describe)
----	-------------------------

Appendix 3

A3: Methodology used to develop the indices used in the analytical chapters

Asset index

The purpose of an Asset Index (AI) is to develop a proxy measure for a household's socio-economic position or long-run socio-economic status (Filmer and Pritchett, 2001). Direct questions concerning wealth were not included in the questionnaire owing to their noted unreliability (due to false reporting or recall bias) and short-term variability (due to seasonality for example). An AI uses proxy measures (such as the physical attributes of the house or social characteristics of the household members) to generate insights around financial stock (permanent income) rather than flow (current income) (Balen *et al.*, 2010). Principle Components Analysis (PCA) provides a means to evaluate the most meaningful aspects of the large amounts of data that are often generated about the physical and social attributes of the survey respondents, thus revealing the underlying structure of the data. The underlying data structure is then used to generate a single measure for each household that represents a household's long-run socio-economic position. This measure can be used to compare different households.

Table A3.1 shows the list of variables, which were initially considered as potential elements of an AI. The list of variables was identified from existing theory concerning asset indexes and insights gained through the field research and subsequent analysis (see, for example, Balen *et al.*, 2010; Filmer and Pritchett, 2001; Hunter *et al.*, 2014; You, 2014).

Table A3.1: The initial variables from which the asset index was potentially constructed.

Variable	Description
Bdrms	Number of bedrooms in property
Heating	Presence of artificial heating (charcoal, wood, electricity)
Ceiling_fan	Number of ceiling fans in the property
Refrigerator	Number of refrigerators
Washing_machine	Number of washing machines
Bicycle	Number of bicycles
M.bike_scooter	Number of motorbikes or three-wheeled scooters
Savings	Presence of savings
Loans	Presence of a loan
HHsize	Number of household members (adults and children)
HHAdult	Number of adults in the household
HHChild	Number of children in the household
Wellbeing	Overall wellbeing of the household
Old.dependants	Number of elderly dependents
Young.dependants	Number of young dependents
Dependants	Overall number of dependents
Dependency.ratio	The ratio of the number of dependents in the household to the number of economically active adults

Table A3.1 (cont.): The initial variables from which the asset index was potentially constructed.

Variable	Description
TotalMU	Total area of farmland available to the household
PlotNum1	Number of plots
AvPlot1	Average plot size
Agric_dependency	Perceived dependency on agriculture
Irrigation	Availability of irrigation
Percent_irrig	Percentage of farmland household able to irrigate
Livestock	Number of livestock owned
Chickens	Number of chickens owned
Fowl	Number of fowl owned
Goats	Number of goats owned
Pigs	Number of pigs owned
OtherFarm	Participation in other farm-related activities (such as fishing or forestry)
Fishing	Participation in fishing
Forestry	Participation in forestry-related activities
Age	Age of household head
School	Number of years the household head attended school
Health	Health status of household head
Remittances	Receipt of remittances

To generate the AI a number of steps were required to transform the data. All non-numeric variables were transformed into numeric values. For discrete variables, where the relative difference between sources was indeterminable, the categories were converted to a simple dichotomous variable (1 = no and 2 = yes) to indicate the presence or absence. For example, the absence of a power supply was coded as 1 and all other power sources (charcoal, electricity, wood and other) were coded as 2. All other discrete variables were recoded with higher numbers signifying increasingly positive attributes. All dichotomous variables recoded to 1 = no and 2 = yes. Don't know responses were interpolated to the mean sample value for that variable. The working sample of households (n=73) consisted of only those cases that were complete.

The transformed data was organised into a correlation matrix to check for internal consistency and uncorrelated and multicollinear variables, variables were removed with a large number of correlations that were <0.2 or >0.9. Factorability was determined through Bartlett's test of sphericity⁸⁵ and the Kaiser_Meyer-Olkin (KMO) test⁸⁶.

⁸⁵ Bartlett's test of sphericity helps to reveal if the correlation matrix is an identity matrix (all variables are completely independent of each other) and not suitable for principle components analysis. An identity matrix is suggested if Bartlett's test was not significant (value of >0.05) (Field, A. P. *et al.*, 2012).

⁸⁶ The KMO test reveals the diffusion in the pattern of correlations. A value close to 1 suggests that the data are relatively compact and that factor analysis would provide reliable distinct factors. Values close to 0 suggest that there is diffusion in the pattern of correlations and that a factor analysis will be inappropriate. For the correlation matrix to be considered acceptable a value ≥ 0.7 was required. The KMO test also provides values for individual variables; variables retained with higher scores, values <0.7 sought for the majority of variables (Field, A. P. *et al.*, 2012).

Variables were excluded (based on Barlett's test for sphericity and the KMO test) in a stepwise fashion to identify a correlation matrix suitable for PCA. Once a suitable group of variables were identified, a further diagnostic tool was used: the determinant of the correlation matrix⁸⁷ (Field, A. P. *et al.*, 2012). An eight variable correlation matrix was identified as suitable for PCA based on the diagnostic tests outlined above.

PCA was run on all variables to reduce the data down to its underlying factors. The number of factors to extract was determined by visual inspection of scree plots, cumulative proportion of variance and Joliffe's criterion⁸⁸. Based on the aforementioned tests, all eight factors were retained and the standardised AI computed using principle (first) component factor loadings or weights (Field, A. P. *et al.*, 2012). Table A3.2 shows the variables that were used in the PCA with some summary statistics and the weighting derived from the principle (first) component analysis. The final AI was derived from the PCA weights and transformed to include only positive numbers and a range from zero to one.

Table A3.2: Variables used in the PCA with some summary statistics and weighting derived from the principle (first) component analysis (all values to 2dp).

Variable	Mean	S.D	Variance	Weight
Ceiling_fan	2.26	1.18	1.39	0.94
Refrigerator	0.62	0.52	0.27	0.12
Washing_machine	0.64	0.48	0.23	0.27
Bicycle	0.74	0.78	0.61	0.08
HHAdult	2.33	0.76	0.58	0.12
Dependency.ratio	0.24	0.25	0.06	0.08
TotalMU	9.06	4.05	16.42	0.08
Age	60.23	12.82	164.32	-0.06

Having calculated the AI for the working sample the process was repeated on the total sample (n=97). Missing values for each variable were populated through interpolation (values for interpolation were derived by calculating the mean of each variable for either case study site).

Table A3.3 shows the AI for each case study site and both sites together. The table shows that Dongdian has a higher mean AI score compared to Wanzhuang suggesting that the households are in a slightly better socio-economic position.

⁸⁷ The determinant of the correlation matrix shows the extent to which the data are singular (value = 0) or unrelated (value =1). A value >0.00001 is necessary for a PCA (Field, A. P. *et al.*, 2012).

⁸⁸ Joliffe's criterion suggests that factors with eigenvalues ≥ 0.7 are retained.

Table A3.3: The values of the AI for both sites and each site individually.

Site	Sample size	AI (4dp)
Dongdian	50	0.4913
Wanzhuang	47	0.3973
Both sites	97	0.4458

A typical household in the top quartile of the AI would tend to come from Dongdian (by a ratio of 2: 1) and have three to four bedrooms with some source of artificial heating. Most households own a washing machine and a refrigerator and all have a motorcycle or three-wheeled scooter to get around in addition to a bicycle. There tend to be between three and four adults per household (average age of about 50 years) with a low dependency ratio (0.33). Most households class themselves dependent on agriculture with larger than average farm sizes. Irrigation is only available to approximately half of this group and only 30 per cent of farmland is available for irrigation within this subset. Most households practice some sort of other farm activities (small-scale animal husbandry) in addition to crop growing.

A typical household in the bottom quartile of the AI is more likely to come from Wanzhuang (by a ratio of 1: 1.4) although the split is more even when compared to the top quartile. Houses tend to be slightly smaller with fewer bedrooms and living spaces compared to the top quartile households. These households are much less likely to own a washing machine or a refrigerator and less than half have access to a motorcycle, three-wheeled scooter, or a bicycle. There tend to be around two adults per household (average age of about 70 years). Interestingly, the dependency ratio (0.15) for this group of households is lower than the upper quartile households. As with the upper quartile most class themselves as dependent on agriculture although farm sizes are much smaller and irrigation is only available to a third of this group (although a comparable area is irrigated). The households do practice other non-crop activities in regard to farming but there is less diversity and it tends to be on a smaller scale.

Indices capturing self-perceived measures of change

The purpose of constructing indices for perceived changes to yield, finance, wellbeing, and agricultural dependency was to gain a comparable insight into how different groups of households perceived change and the direction of that change over time. For example, through the indices one could compare the perceptions of households with migrant members and households with no members practising mobility. The indices were all constructed using the same simple methodology. Information on changes to yield, finance, wellbeing, and agricultural dependency (at date of survey compared to five years ago) were collected through the household survey. Respondents were asked to respond to four questions in a closed format outlined in table A3.4 below.

Table A3.4: Variable and list of options possible for respondents to select.

Variable	Yield	Finance	Wellbeing	Agricultural dependency
Question in household survey	Compared to 5 years ago have your crop yields changed?	Compared to 5 years ago do you think your household's financial position has changed?	Compared to 5 years ago do you think your household's wellbeing has changed?	How dependent are you and your household on agriculture for your livelihoods?
Possible responses	Increased	Got better	Got better	Completely dependent
	Decreased	Got worse	Got worse	Dependent
	Stayed the same	Stayed the same	Stayed the same	Not that dependent
	Not comparable			Not dependent at all

Responses from the household survey were filtered to exclude those who stated that they were unable to recall the flood and drought events or were incomplete (precluding subsequent analysis). Additionally, one respondent stated that he or she was unable to make a meaningful comparison for crop yield and was also excluded. The data processing and cleaning resulted in a useable sample of 62 households, of which 33 were from Dongdian and 29 were from Wanzhuang (see Table A3.5 and Table A3.6).

Table A3.5: Responses to questions capturing changes in yield, finance, and wellbeing (at date of survey compared to five years ago) (n=62).

	Positive change	No change	Negative change
Yield	39	12	11
Finance	36	3	23
Wellbeing	46	4	12

Table A3.6: Responses to questions capturing perceived dependency on agriculture for household livelihood changes (at date of survey compared to five years ago) (n=62).

	Completely dependent	Dependent	Not that dependent	Not dependent
Agricultural dependency	24	23	11	4

Some simple common transformations were applied to the data to create a single value for different groups of households. For yield, finance, and wellbeing, the positive change value was multiplied by three, the no change value was multiplied by two, and the negative change value was multiplied by one. The totals were summed and divided by three to give one value for each group of respondents and converted to per cent. A similar process was repeated for agricultural dependency although, as there were four categories, the completely dependent value was multiplied by four with the subsequent categories multiplied by three, two and one respectively. The total was summed, as

with yield, finance and wellbeing transformation, divided by four (as there were four categories rather than three) and converted to per cent. Table A3.7 shows some simple summary statistics for the entire sample (n=62).

Table A3.7: Simple summary statistics of the transformed data capturing changes in yield, finance and wellbeing and agricultural dependency (compared to five years ago) (n=62; all values to 2dp).

	Mean	S.D	Variance
Yield	82.75	7.04	49.58
Finance	75.25	4.50	20.25
Wellbeing	85.00	6.73	45.33
Agricultural dependency	75.00	7.62	58.00

Index capturing externally-perceived level of wellbeing

The index representing externally perceived measure of wellbeing was derived from the output of a rapid rural appraisal activity (RRA). The output of the RRA activity ranked all members of the community according to the perceived level of wellbeing (see section 3.2.3). The ranking provided a comparative measure showing how the participants of the RRA exercise perceived the members of the community at that point in time (it does not capture change over time). In both case study sites, the participants of the RRA activity created three groupings, representing different categories of wellbeing (upper, middle and lower). Using the same methodology outlined above, these categories were converted into a single value. The upper group was multiplied by three, the middle group was multiplied by two, and the lower group was multiplied by one. The totals were summed and divided by three to give one value for each group of respondents and converted to per cent (see Table A3.8 for some simple summary statistics).

Table A3.8: Simple summary statistics of the transformed data capturing externally perceived measure of wellbeing (n=62; all values to 2dp).

	Mean	S.D	Variance
Wellbeing ranking	61.75	6.60	43.58

Appendix 4

A4: Chinese economic, social, political and cultural context

Pre reform era developments

The People's Republic of China was founded in 1949 after a tumultuous civil war between the Communist Party of China and the *Guomindang* (nationalists). Mao ZeDong, leader of the Communist Party, became the founding father of the People's Republic of China and ruled until his death in 1976. During his leadership China underwent huge social change that is still reverberating throughout the country today. China is a young country and many people, particularly the older generations, still recall the emergence of the country and the often, huge upheavals that followed as China embraced communism and the subsequent reforms during the opening up period from 1978 onwards. Appreciating the uniqueness of China in terms of its history, politics and culture is crucial in fostering increased understanding about changes and decisions that are made today. Choices and actions, whether governmental decisions about land reform or individual decisions about a child's education do not exist in a vacuum: they are situated within the existing social, political and cultural milieu (Deshingkar, 2005; Hugo, 2011; Rigg, 2012).

The influences of the socialist period (socially, politically, culturally, economically and environmentally) and the subsequent changes in the reform era have had and continue to exert a profound influence on Chinese society and its citizens. This appendix stresses some of the key developments and changes that have occurred in China over the past half a century that have specific relevance to and provide a suitable backdrop for the research. The appendix provides a highly selective account of specific incidences in China's history rather than a general overview or comprehensive analysis of all the major developments that have occurred since the formation of China. Specifically, it describes three key areas within which the Communist Party exercised a high level of control over everyday life for prolonged periods. From the 1950s up to and beyond the beginning of the reform era, the Chinese Government strictly controlled movement (particularly rural to urban) through the *Hukou* system. In the realm of reproduction, the Government played an increasingly invasive role that culminated in the one-child policy and nationwide campaigns to limit population growth. In rural life, through the establishment of village communes the Government promoted the collective over the family, tearing down centuries of traditional land management and rural traditions. Through these reforms I demonstrate the level of intervention practiced by the state on family ties, village society and the rural way of life. Although the state has stepped back from some of the more extreme interventions, their impacts are still reverberating today and have, at least a partial influence, in how people react and respond to present day events.

Movement restrictions up to 1978

As with many socialist countries in Asia, China instituted a policy to register and limit the movement of the population. The *Hukou* system was first established in cities in 1951 and rural areas in 1955 and designed as a means to provide the state with population statistics, control and regulate population movement and distribution, and to identify social status to help reinforce and maintain social control⁸⁹. In the pre-reform era, the *Hukou* system was rigorously enforced and served as an effective means of limiting the movement of people by strictly controlling the conversion process through which an individual could change their status from agricultural to non-agricultural and geographic designation from rural to urban (Chan and Zhang, 1999).

The *Hukou* system linked place of residence and status with a range of state benefits and entitlements (such as food welfare, social security and access to health care, jobs and housing); in other words a citizen could only access these services if their *Hukou* registration corresponded with their current location. These mechanisms served to effectively control population mobility during the pre-reform era and restrict rural to urban migration (Miller, 2012). Through the implementation of the *Hukou* system, the state had effectively stratified the population based on ones rural or urban designation. For rural dwellers, freedom of movement was circumscribed to such an extent that it was virtually impossible to relocate (especially to an urban area) unless sanctioned by the state through its Public Security Bureau. Conversely, for urban dwellers, the benefits of their *Hukou* status served to insulate them from even the worst impacts of the famines in the late 1950s and early 1960s (Chan, 1996).

One-child birth policy

From the 1950s through to the 1960s, policy makers in China paid little attention to family planning. In the 1970s, interest in family planning was increasing and, from 1973, there was a concerted effort by the Government to control population growth through mass campaigns: an example of which is typified by the slogan *wan, xi, shao* that called for late marriage and childbearing (*wan* = late), birth spacing (*xi* = spaced) and fertility limitation (*shao* = few) (Peng, 1991: 36). However, by the late 1970s, these measures had failed to limit the growth of the population and more stringent approaches under the headline of the “one-child policy” were implemented to try and limit the population to 1.2 billion by 20090. The universality implied by the one-child

⁸⁹ The *Hukou* system is a dual classification system consisting of *Hukou Suozaidi* and *Hokou Leibie*. *Hukou Suozaidi* identifies the place of residence and is typically urban or rural whilst *Hokou Leibie* is the type of registration and will typically be agricultural or non-agricultural.

⁹⁰ This limit was considered essential to ensure China achieved the desired level of economic and social development (Attane, 2002: 104)

policy hides considerable variation in its implementation. For example, in urban areas, for the ethnic Han majority, the policy was rigorously enforced. However, for ethnic minorities and the majority of the rural population the policy was relaxed so that two children or even three children were permitted.

Notwithstanding the variation outlined above, throughout the 1980s family planning policy was constituted as a much more top down measure and the state loomed ever larger in family decisions regarding reproduction. The visibility and influence of the state within what might be considered traditionally private space (certainly in Western eyes) was despite the stated official policy of voluntarism. Indeed, throughout the 1980s China's family planning programme was characterized by mandatory family planning and contraceptive methods, national limits on the number of children per couple, and the use of one-child pledges and family planning contracts in policy implementation. These behavioural measures were augmented with more punitive and invasive measures such as forced sterilisations and abortions (Hardee-Cleaveland and Banister, 1988; Peng, 1991). Reports of violent clashes between local birth control officials and the rural population that often involved the confiscation or destruction of property were not uncommon. Indeed, there was widespread dissatisfaction and outright hostility internally and strong condemnation of the policy and the way in which it was implemented internationally (Hardee *et al.*, 2004: 68-69; Wang, 2005: 6).

For example during the majority of the 1980s, in urban areas like Shanghai, authorisation for a family to have a second child was tightly controlled and only permitted in 20 to 50 per cent of cases. This differs from Anhui (considerably poorer and more rural), where a second child was permitted if the first child was a girl or the parents were experiencing significant hardship (Attane, 2002: 104). Reports from the case study sites elicited through rural appraisal exercises reveal that family planning was implemented, sometimes very stringently, in the area. For example, in Wanzhuang villagers reported that:

'[the campaign s]tarted imposing fines, doing the sterilisation operation'

'When it comes to the end that was very strict, would rather to be flowed with rivers of blood than giving one more birth'

'There's a mission, when you see someone's pregnant, catch her and hand her over as the mission' (20130502 RRA4WZ)

Although not described in as much detail in Dongdian, villagers did report that the birth control policy was implemented quite stringently in the 1980s.

The one-child policy is now more than 30 years old and, despite some further relaxations, is still rigorously enforced and continues to wield a very real influence on the lives of Chinese families. A generation in China has grown up knowing nothing but the one-child policy and the implications of the rigorously enforced campaigns in the 1980s and 1990s will continue to be felt for decades to come (see for example the huge body of literature on 'Little Emperors'). Feng *et al.* (2013: 126) go so far as to state that '[h]istory will remember China's one-child policy as the most extreme example of state intervention in human reproduction in the modern era'.

Communal farming

During the 1950s and 1960s, China's rural landscape underwent dramatic changes as the Communist Party implemented a series of land reforms. Land was expropriated from landlords and divided up amongst peasant co-operatives to help realise the communist dream. As the 1950s progressed, further land reforms saw the collectivised farming system emerge. During this period, farm collectives were organised into gigantic village communes, brigades and production teams. The household was supplanted as the basic social unit of farming and decision-making was taken out of the hands of farmers. Murphy (2002: 32) states '[t]hrough collectivization, the state appropriated control over the family's management of labor [sic], production, and consumption, thereby attempting to reorient producers' energies from the needs of their families toward the needs of the collective.' This account of collectivisation is supported by responses elicited through a rural appraisal activity in the case study sites. For example, in Wanzhuang a villager reported, '[o]ne production team per village, people farm together ... eat together. Originally it was one production team per village' (20130502 RRA4WZ). The quotes from the villagers allied to the more general account, drawn from secondary sources, suggest that farmers lives effectively fell under 'the direct control of the cadres' (Zhou, 1996: 2) who dictated what they farmed and how they lived.

Following the collapse of rural production and the famine in 1959 and 1960, the collectivised system was reworked and production teams became the main social unit of farming. The production teams were carried forward from the Great Leap Forward but were much smaller with the leadership often drawn from its members. The Chinese leadership hoped that the reconfigured production teams would lead to stronger relations between the people and the land, resulting in productivity improvements. Production teams were afforded more autonomy than previously but the state still exerted a significant amount of control and dictated, for example, what was planted (regardless of its appropriateness). Despite these innovations villagers saw the power

of Chinese authorities as 'overwhelming and irresistible' (Unger, 2002: 11). This system of agricultural production (and subsequent iterations) was to remain in place until the mid to late 1970s and the beginning of the reform era.

In summary, the Maoist era (from the formation of China up until Mao's death in 1976) witnessed the expansion of state apparatus and control over the lives of rural peasants. The account above shows the central role of state within three key facets of daily life in rural China: movement, reproduction and families, and work. As Zhou (1996: 2) states, in the introduction to her book about the influence of farmers on Chinese society, '[i]n the course of these changes, the lives of the farmers fell under the direct control of the cadres ... who in effect become their overlords'. The interventions implemented by the Communist Party were long lasting and have remained in place up until the reform period and often beyond. The state extended its influence into every aspect of rural life and this has strong repercussions on how people think, act and perceive the world around them today.

GaiGe KaiFang (reforms and openness)

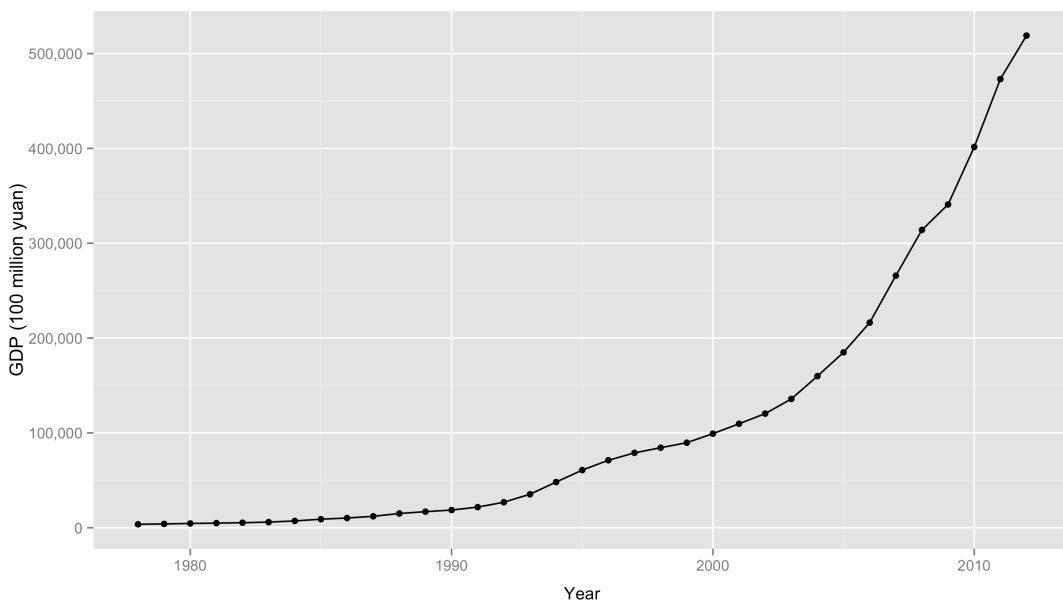
China has undergone massive economic and structural reforms since the late 1970's and the beginning of the reform era. The tumult and turmoil that was experienced under the leadership of Mao during the 1970s (witness the anarchy of the Cultural Revolution) gave way to economic reform and a more international outlook (Garnaut, 2001). The reforms initiated by Deng Xiaoping have seen the country develop at a phenomenal rate: the economy has recorded record levels of growth, foreign trade and consumption has increased massively, and living standards have improved markedly for the majority of China's population (Garnaut and Huang, 2001). The changes in China have been profound, touching all parts of the country and sections of society.

Economic development and rural transformation

Following Mao's death in 1976 and the rise of Deng Xiaoping as reformist leader of China, the Communist Party instigated a series of reforms that stimulated the Chinese economy. This period, from 1978 onwards, is known as the reform era and was characterised by the four overarching modernization goals of agriculture, industry, science and technology, and military. Economically, the changes signalled a transition from a centralised, top-down, planned economy to a more market based economy – "Socialism with Chinese characteristics" (Dengist ideology quoted in Li, 2013: 5). During this period control was ceded from the core and devolved to provinces and local officials.

Foreign direct investment and trade was encouraged through the establishment of Special Economic Zones (such as Shenzhen and Pudong New Area in Shanghai) and the formation of private firms encouraged (Garnaut, 2001; Li, 2013). By the mid-1990s, the system of state owned enterprises, the basis for Chinese industrialisation and the urban economy, were being dismantled to encourage private investment and stimulate the rural economy through township and village enterprises (Economy, 2004). Liberalisation gathered momentum throughout the reform era with the use of markets expanding into more sectors of the economy, an export-led development strategy and increasing private ownership in industry and housing for example (Zhao, 2012). The changes contributed to the phenomenal growth in the size of the Chinese economy (see Figure A4-1).

Figure A4-1: Chinese GDP (in 100 million RMB) from 1978 to 2012 (data calculated at 2013 prices) (China Statistical Press, 2013: 2-1).



Agricultural reform was a key driver underpinning these national, macro economic changes (Zhao, 2012). Increasing production and securing more farm products for the state were central to Deng's vision and formed the means through which he hoped to achieve his four modernizations. Concurrently, rural peasants were also keen to reform and provinces such as Anhui (famously Fengyang prefecture) and Sichuan were at the vanguard of this drive. In the late 1970s and the early 1980s some collectives had been experimenting with different forms of individual and group contracts for agricultural production: in effect undoing the collectivisation implemented under Mao (Kelliher, 1992; Murphy, 2002; Unger, 2002). These twin forces, political from above and more spontaneously from below, combined to drastically reshape the rural landscape in China over the next 10 years (Zhou, 1996).

During the early 1980s the benefits of a decollectivized approach to farming were becoming more apparent to farmers and decision-makers alike (from the local cadres to the provincial leaders and national Party leadership) as rural productivity and living standards increased substantially (Lin, 1992; Putterman, 1993; Zhou, 1996). By the mid-1980s the clamour for change had led to the Communist Party sanctioning a shift from the collective model of farming to one that was focused once more on the household. Under the Household Responsibility System production teams were still required to meet quotas but achieving these quotas was devolved to the household (Lin, 1992). Furthermore, once the households' quotas had been met, households were able to exercise much greater freedom as a famous slogan encapsulating the reform highlighted: "once a peasant's state quota and collective contribution have been fulfilled, the rest is his to dispose of as he wishes." (quoted in Cao and Birchenall, 2013: 167).

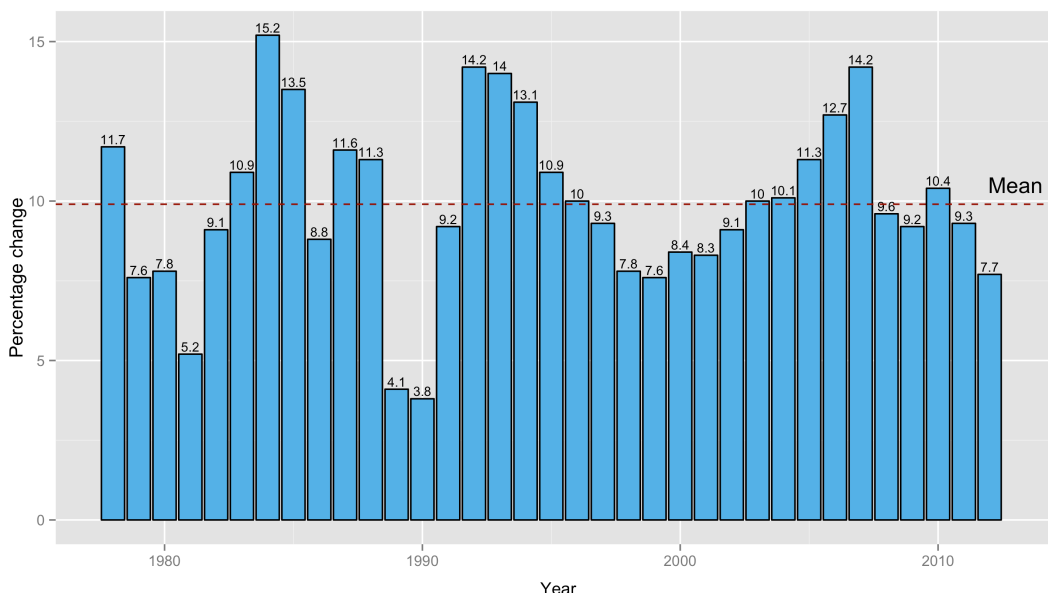
Over the course of the reform era the transformation of the countryside was phenomenal, as Kelliher (1992: 18) states, '[I]and tenure, rent, taxation, the sexual division of labor [sic], inheritance, credit, religious practices, income, private enterprise, collectivism, migration – hardly anything that mattered in rural life emerged untouched'. Agricultural production increased substantially. For example, gross agricultural output has increased on average by 5.63% over each five-year period since 1985 (derived from Table 4 in Wang, 2013: 59). Concurrently, the employment share in agriculture has decreased markedly from 69 per cent in 1978 to just 26 per cent in 2007. Conversely, the employment share of non-state, non-agricultural jobs has increased from 15 per cent to 62 per cent over the same period (derived from Table 4 in Zhu, 2012: 111). In 2013, agriculture in China sustained 22 per cent of the global population with only 7 per cent of the world's arable land and remains one of the most important sectors of the economy contributing 10 per cent to Gross Domestic Product. The importance of agriculture is recognised by the Chinese Government; it is committed to maintaining at least 120 million hectares of arable land despite increasing pressures from urbanization, desertification, and degradation (Li *et al.*, 2011; Liu *et al.*, 2012). National food security is a key aim of the 12th Five Year Plan that runs from 2011 to 2015 (PRC, 2011).

A key outcome of the rural transformation was to increase farm efficiency and free up rural labour (as seen in the increasing level of agricultural output and falling employment share). At the same time, China's rapid industrialisation was creating a huge demand for low skilled labour that could only be met from rural areas. Together these changes (along with other factors) created very favourable conditions for the rural population to seek employment in urban areas. The Special Economic Zones

(mentioned previously) saw the first pioneer migrants leave their homesteads for urban areas. By the late 1980s the trickle had turned into a steady stream as factories and industrial development expanded rapidly in the southern coastal area (Miller, 2012). Throughout the 1990s and into the new century rural to urban migration continued to increase at an unprecedented rate as China industrialised at a fantastic pace. The rural migrant became one of the main driving forces of the Chinese economy, providing cheap labour that enabled China to compete on the global stage.

Cumulatively, the changes have contributed to the prolonged period of growth at an average of 9.9 per cent per annum (see Figure A4-2). Poverty has been reduced from 835.1 million people (84 per cent of the population) in 1981 to 84.1 million people (6.3 per cent of the population) in 2011⁹¹ (World Bank, 2012). China has gained a reputation as the ‘factory of the world’ and in 2001, cemented her place at the top table, economically speaking, with entry into the World Trade Organization. In the countryside, almost every aspect of rural life underwent dramatic reinvention as land use rights at a household level were re-established, commodity markets (in a limited fashion) were reintroduced and the household was, once again, responsible for what and how to farm. People and labour were no longer so bound to their place of birth or production team.

Figure A4-2: Per cent change in GDP per annum from 1978 to 2012 (China Statistical Press, 2013: 2-4).



⁹¹ Population below \$1.25 a day is the percentage of the population living on less than \$1.25 a day at 2005 international prices. Proportion of population figures based on population estimates for that year.

Demographic transition with population urbanizing rapidly

A key aspect of the reform era has been the gradual relaxation of the Household Registration or *Hukou* System. The Chinese Government began loosening movement restrictions in the late 1970s and early 1980s through *Hukou* reform that dramatically increased the mobility of the population and the number of people migrating. The reform era has seen the mass movement of rural migrants who provided a cheap and plentiful supply of labour for the rapidly urbanizing and industrialising economy (Cai, 2003; Peng, 2011) (as outlined above). In 1953, just 13 per cent of the population resided in urban areas and this had only increased to 20.9 per cent by 1982 (four years into the reform era). By 2012 (30 years later) 52.6 per cent of the population were living in an urban area (Yang, X. J., 2013). In absolute terms, an additional 197.08 million people were living in urban areas in 1982 compared to 1953 and a further 255.2 million people in 2010 compared to 1982 (an increase of 452.28 million people since 1953) (Peng, 2011).

The broad patterns of movement are West (interior) to East (coastal belt) and the biggest source provinces are Henan, Anhui, Sichuan and Hunan (Zhu, 2003). At a regional or provincial level much literature suggests that migrants moved for economic reasons although sub-regional patterns are more complex and multi-faceted (Zhang, 2008; Zhu, 2003; Zhu, 2007; Zhu and Chen, 2010). For example, Poston and Zhang analyse provincial migration in the 1990s and conclude distance is a major barrier to movement with migration predominantly between contiguous provinces (2008). A slightly different analysis is presented by Chan (2011) who shows that inter-provincial migration has increased since the 1990s and, while the receiving areas have remained constant (Guangdong and Shanghai), the sending areas have diversified (see Figure A4-3a, Figure A4-3b and Figure A4-3c). The dramatic increase in the size of the urban population in this period can be attributed almost entirely to rural to urban migration⁹² (Zhang, 2008). Geographically the Eastern seaboard is the most rapidly urbanizing area with two of the three major city regions located there (the Yangtze River Delta encompassing Shanghai and the Bohai Rim Region that includes Beijing and its environs⁹³) (Zhang, 2008).

⁹² This picture is complicated somewhat by the ongoing administrative reforms that have seen the municipal boundaries of cities redrawn to encompass predominantly rural areas. The three main mechanisms by which this has occurred are the system of 'city administering county', converting county into city' and the annexation of suburban counties (Zhang, 2008).

⁹³ The other being the Pearl River delta in the South of the country (the Guangdong city region) adjacent to Hong Kong.

Figure A4-3a: The 30 largest inter-provincial migration flows in China for the period 1990-1995 (from Chan, 2011: 12-13).

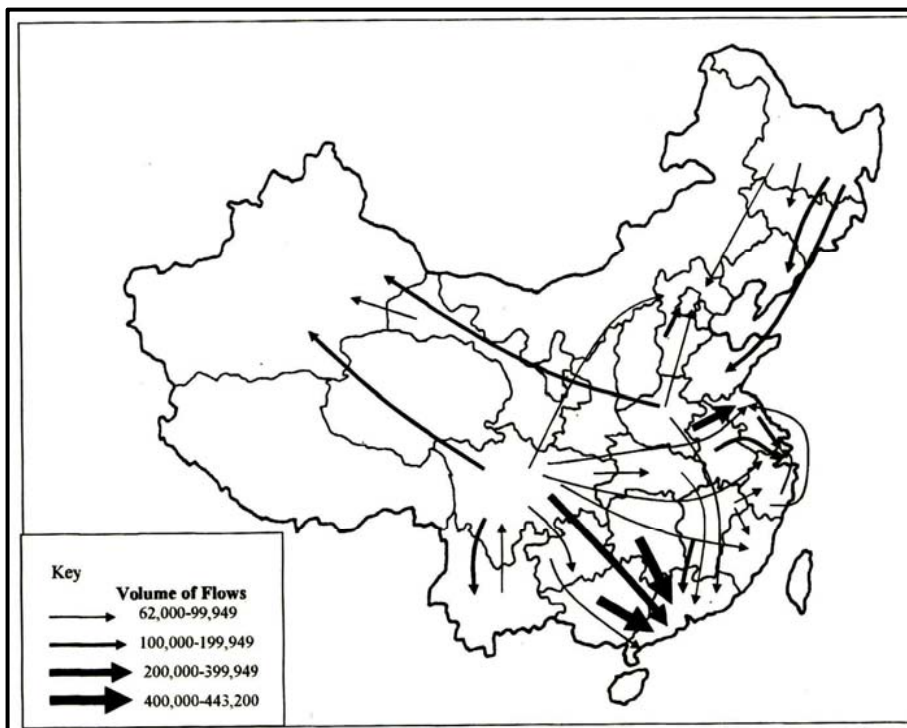


Figure A4-3b: The 30 largest inter-provincial migration flows in China for the period 1995-2000 (from Chan, 2011: 12-13).

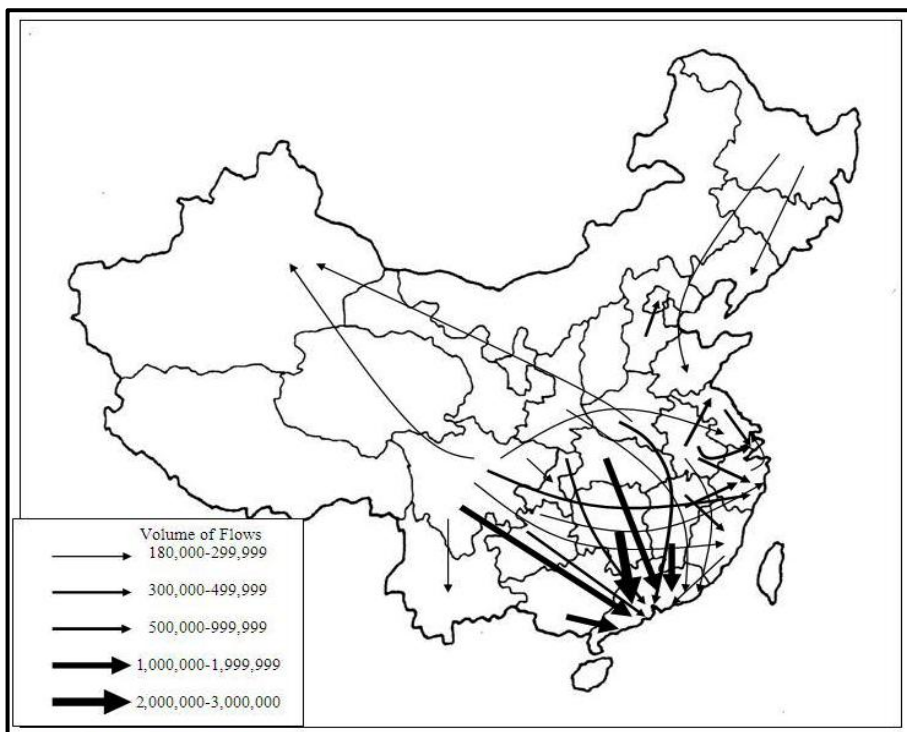
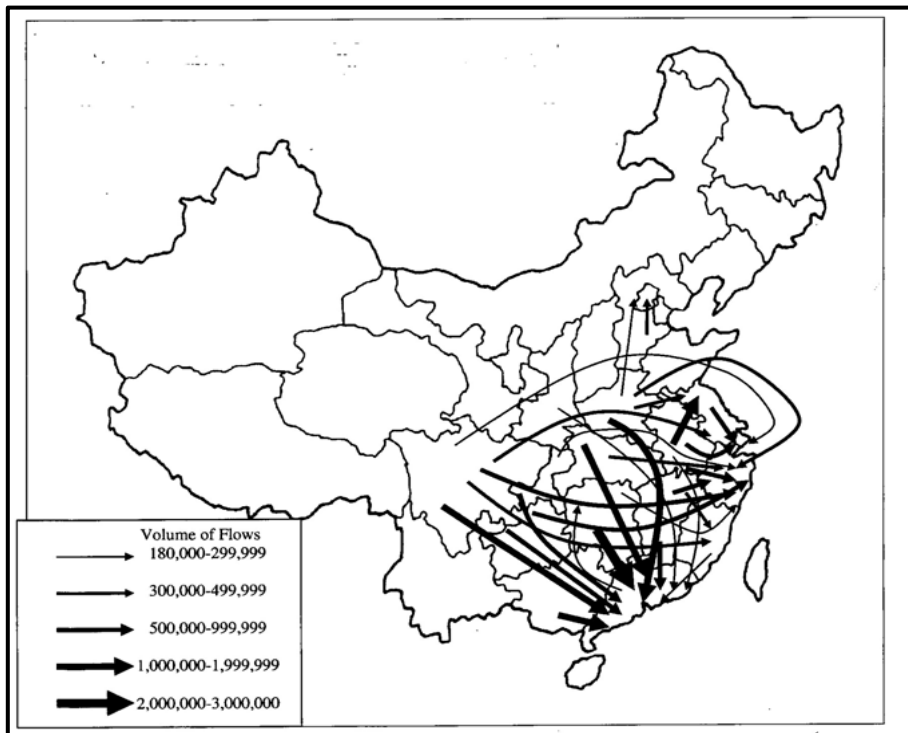


Figure A4-3c: The 30 largest inter-provincial migration flows in China for the period 2000-2005 (from Chan, 2011: 12-13).



The opening up of the Chinese economy in the reform era and the growing mobility of the population has increased the pressure on the *Hukou* system. In response to the pressures described above (brought about by an increasingly market-led economy) the state has implemented a number of reforms to maintain the relevance of the *Hukou* system in today's society (Zhang, 2008). For example, the Government has introduced a special channel to permit changes in *Hukou* status for previously excluded groups; an urban category for households with self-supplied grain (although this more symbolic than of any practical use); and a blue stamp urban *Hukou* (that effectively commoditises the system by providing an urban status for a fee provided that the candidate has a suitable level of education and / or has made appropriate investment in the country) (Chan and Zhang, 1999). These changes are symptomatic of a gradual relaxation of the *Hukou* system and attitude to migration over the last 30 years and also correspond to a weakening of state power. In spite of these reforms however, the essential features of the *Hukou* system remain and still act as a strong disincentive to mobility for certain sections of society (Cai, 2003; Zhang, 2008).

These developments have resulted in two streams of migrants: state sponsored or permanent (with associated change in *Hukou* status and location) and 'floating' or temporary⁹⁴ (*Hukou* status and location remain registered in source location). The largest flows of permanent migration occur around the city regions of Shanghai

⁹⁴ The designation 'temporary' refers to the *Hukou* status rather than the permanence or otherwise of the migration.

(Yangtze River Delta) and Guangdong (Pearl River Delta). The source areas tend to be contiguous provinces with comparatively low levels of GDP. The patterns of temporary migration are similar to the permanent migration although the numbers are considerably larger (Poston and Zhang, 2008). Indeed by the mid 2000s it is estimated that there were approximately 150 million floating migrants in China although serious uncertainties in official statistics prevent the painting of a more accurate picture (Deshingkar, 2005; Gemenne *et al.*, 2008; Zhang, 2008). Reliability and continuity of (migration) data at all levels of Government is often highlighted as a key barrier to research in this area⁹⁵ (Simelton, 2011: 37-38; Zhang, 2008; Zhang, 2011).

The benefits of the economic reforms have not been felt evenly across the population (see Figure A4-4 and Figure A4-5). The income gap between urban and rural regions and populations is growing and remote provinces have struggled to replicate the successes of the more prosperous Eastern seaboard (Song *et al.*, 2013). In 2010, the average urban per capita household income was 7805 RMB whereas the average for rural households was 3674 RMB, less than half (derived from Supplementary Table 3 in Xie and Zhou, 2014). Similarly, the prevalence of urban poverty rate was just 0.9% in 2008 compared to a rural poverty rate of 22.3% (although the rural poverty rate has dropped from 94.2% since 1981) (Zhu, 2014).

⁹⁵ See the discussion in Chan (2012) on the different data series used to make estimates on migration volumes for an idea of the complexity of the statistics, the myriad of definitions used and the number of agencies involved in collecting the data.

Figure A4-4: Income differences by province and urban / rural status. Entries represent ratios relative to urban families in Beijing, so urban Beijing is set to 1. In 2010, the average household income per capita in urban Beijing was 29,073 RMB (Xie and Zhou, 2014: data adapted from ST1).

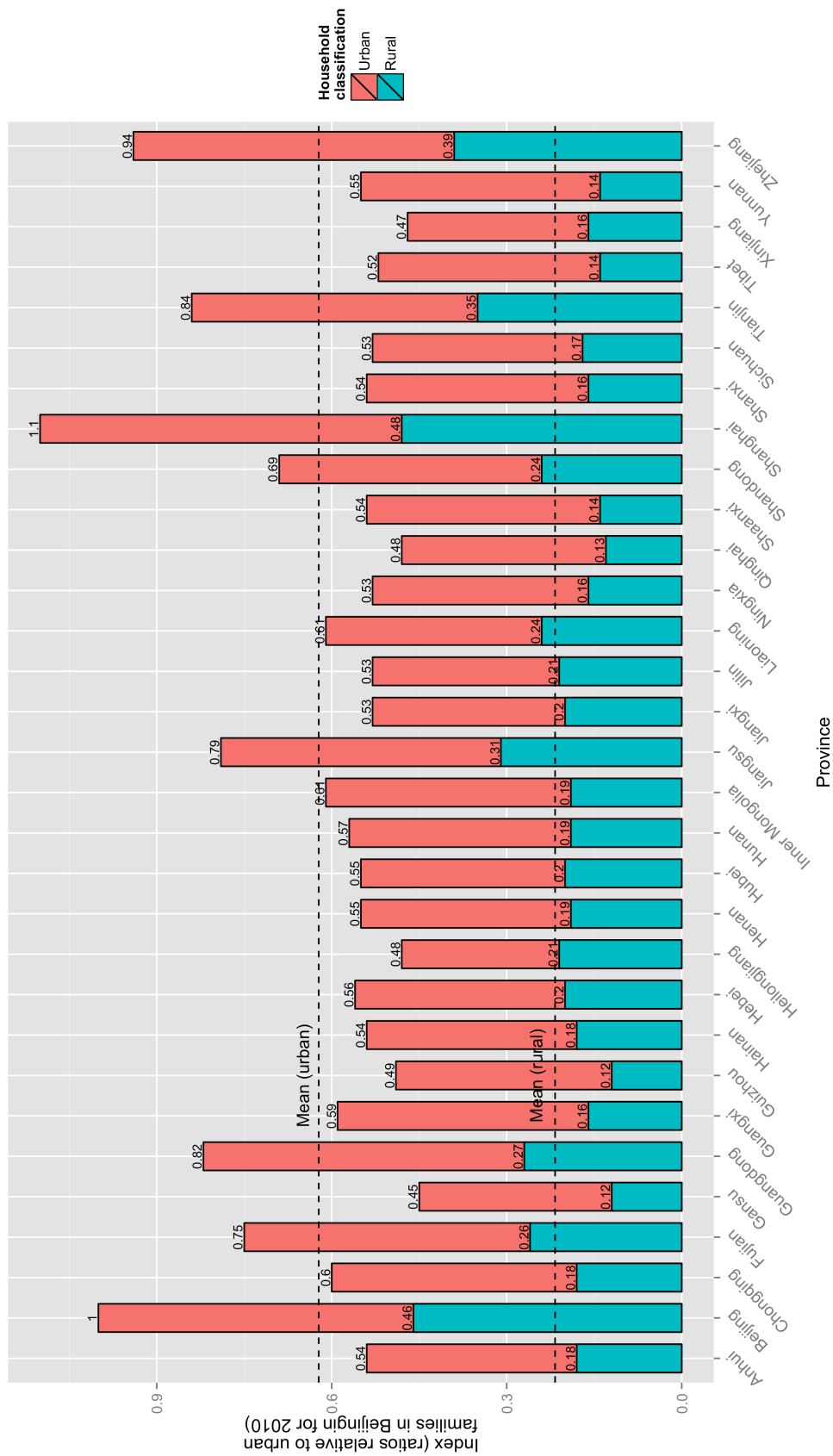
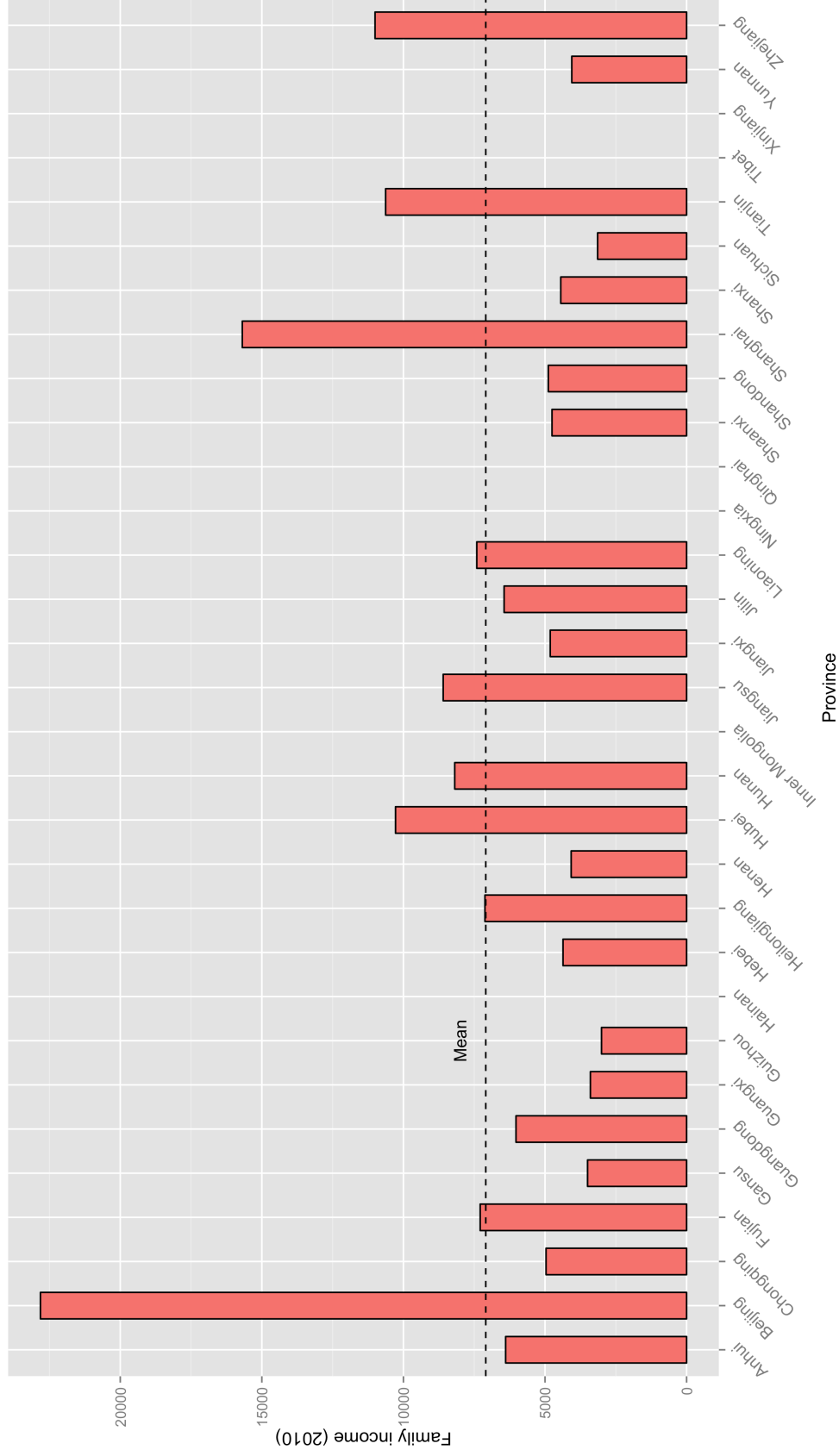


Figure A4-5: Average family income per capita in 2010 RMB. Note that reported family income in this figure is derived from a different data source compared to Figure A4-4 (above) and explains the difference in values for the provinces (Xie and Zhou, 2014: data adapted from ST3).



The figures show, quite clearly, the importance and successes of the provinces and city-states along the eastern seaboard (Beijing, Fujian, Guangdong, Jiangsu, Shandong, Shanghai, Tianjin and Zhejiang) compared to the more remote and rural ones (such as Gansu, Guizhou, Qinhai and Sichuan). The analysis also reveals that the difference between the urban and rural income is largest for the provinces along the eastern seaboard. This indicates that rural incomes have not increased as quickly as urban incomes when provinces have developed, providing further evidence of the uneven nature of the growth. Anhui is just below average for urban and rural per capita household income and average per capita household income.

In summary, the reform era has seen a dramatic increase in living standards and poverty reduction and a huge transformation of the social and cultural landscape as China has moved from a predominantly rural country to a majority urban one. The implications of this change can be seen in the renegotiation of traditional gendered household roles and the obligations within a patrilineal society, huge streams of rural migrants unable to access the same level of service as their urban cousins (see Results Chapter 1) and uneven growth both within and between provinces. Over the last 20 to 30 years, China has emerged as a global actor on the world stage and this emergence is a key reason why some commentators are calling this century the Asian century (Asian Development Bank, 2011; Davies, 2014). Top down reform interwoven with a desire for change from the bottom up unleashed a whirlwind of economic, social, cultural, and political change. These changes were felt at every level of Chinese society from the smallest *zu* (village) or *xiang* (township) to the *sheng* (province) or *shi* (municipality).

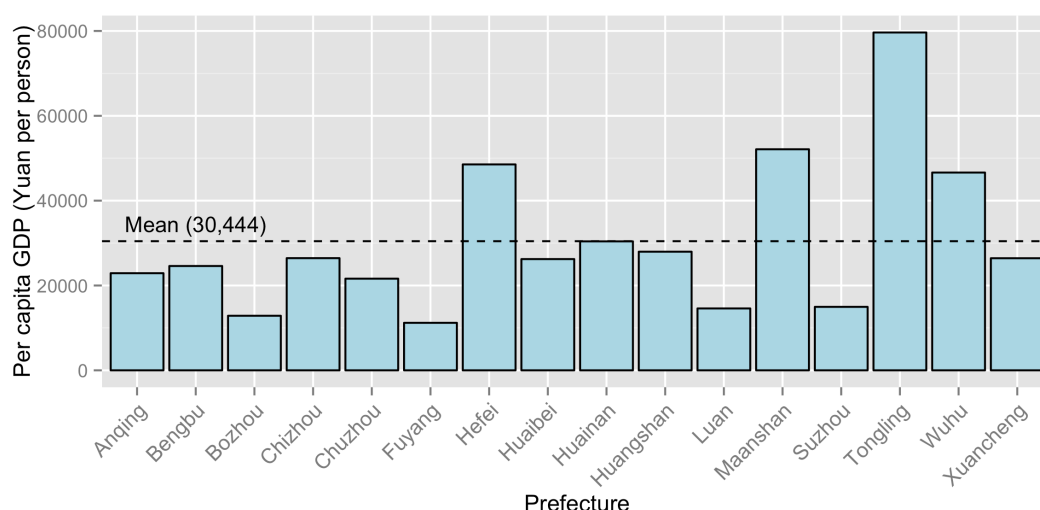
Appendix 5

A5: Selective economic data by prefecture for Anhui

The case study sites are located in Bozhou Prefecture in the north of the province. Bozhou, is situated in the northwest arc of prefectures and one of the poorest in Anhui along with Fuyang, Luan and Suzhou. This part of Anhui is still predominantly rural, economically poor and is not well connected with the rest of Anhui and other parts of China. Bozhou has the second lowest GDP per capita (see Figure A5-1) of all prefectures in Anhui. Agriculture is a very important component of Bozhou's GDP contributing 26 per cent in 2011 (See Figure A5-2). This figure is amongst the highest for all prefectures in Anhui with only Fuyang and Suzhou contributing more as a proportion of GDP.

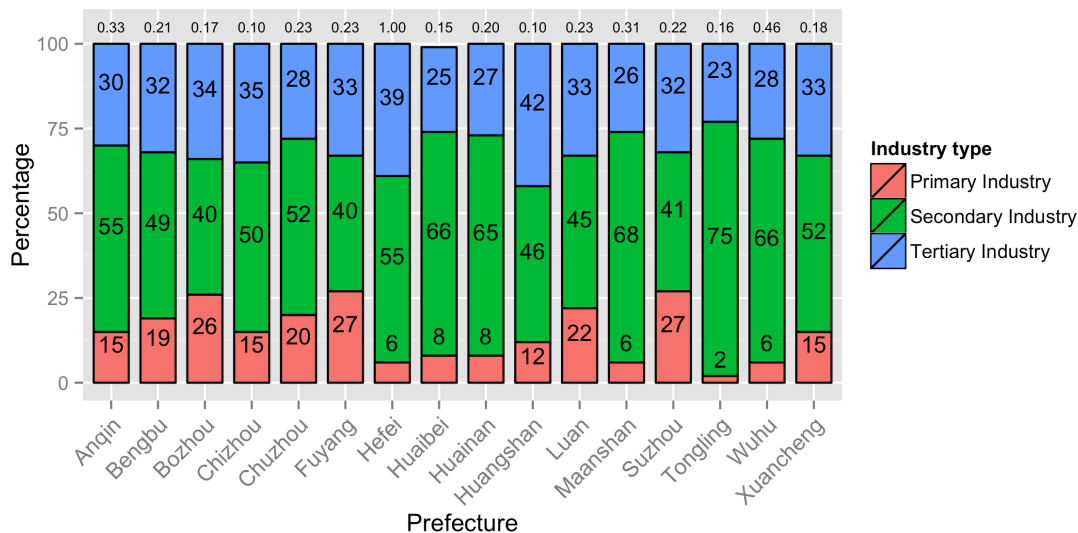
The three main cereal crops grown in the prefecture are rice, wheat and corn (see Figure A5-3). The only main cereal crop that is not grown in Bozhou is rice, which is grown in and around the Yangtze River prefectures in the south of the province. The other two crop groups that make up the top five grown in Anhui by weight are vegetables and melons. More than 90% of the population⁹⁶ (individuals) are classified as living in rural areas (China Statistical Press, 2012: 3-27) with half practicing agricultural activities, which is the third highest in Anhui (behind only Suzhou and Fuyang) (China Statistical Press, 2012: 3-19).

Figure A5-1: Gross Domestic Product per capita for 2011 for prefecture administrative districts in Anhui (data calculated at 2011 prices). Data derived from Anhui Statistical Yearbook 2012 (China Statistical Press, 2012: 2-17).



⁹⁶ Figure is per person includes all individuals who were living in Anhui during the 2010 census and when the estimates were made for 2011. The figure excludes those who have been away for more than six months. See China Statistical Press (2012: 3) explanatory notes for more information on definitions of populations included in estimates.

Figure A5-2: Contribution of primary, secondary and tertiary industry in 2011 to Gross Domestic Product for each prefecture in Anhui (data calculated at 2011 prices). Value of Gross Domestic Product shown above each bar as a ratio to Hefei (Hefei is equal to 1.00). The value of Hefei Gross Domestic Product in 2011 was 363,600,000,000 Yuan. Data derived from Anhui Statistical Yearbook 2012 (China Statistical Press, 2012: 2-17).



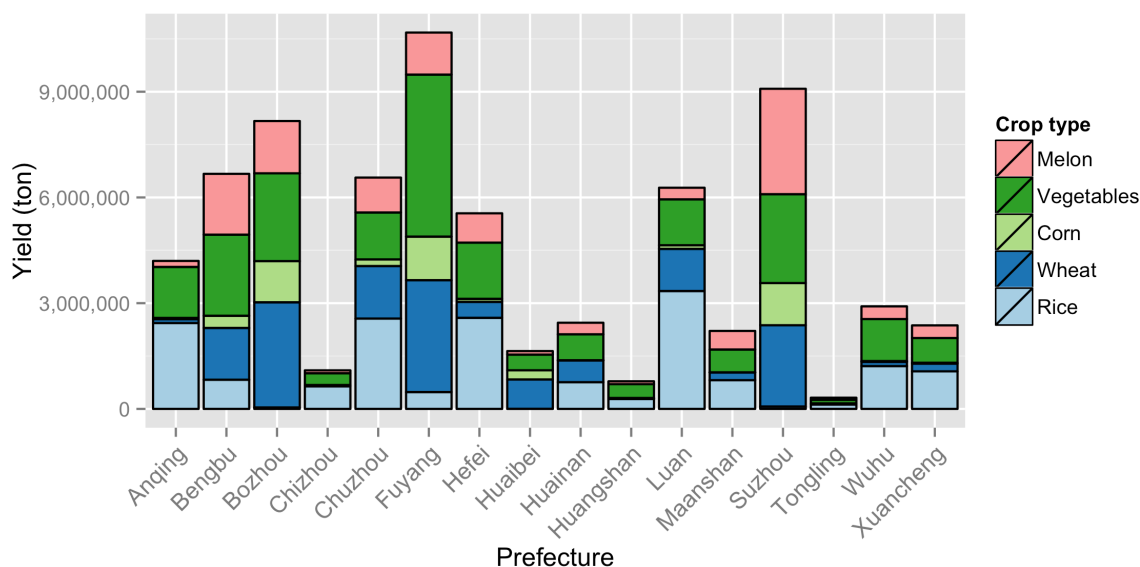
Notes:

Primary industry: agriculture (including farming, forestry, animal husbandry and fishery).

Secondary industry: industry (including mining and quarrying, manufacturing, production and supply of electricity, water and gas) and construction.

Tertiary industry: all other industries not included in primary or secondary industry.

Figure A5-3: Yield of the top five crops grown in Anhui by prefecture in 2011 in tons. Data derived from Anhui Statistical Yearbook 2012 (China Statistical Press, 2012: 12-27).



Appendix 6

A6: Chinese climate context and impacts on agriculture

Characterising China's climate

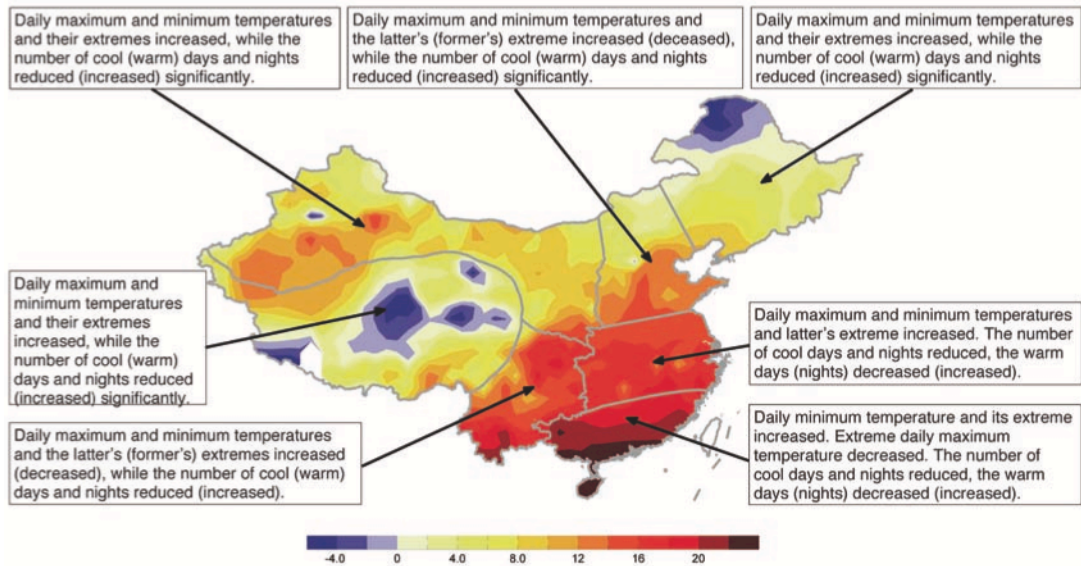
Temperature and precipitation patterns

The monsoonal continental climate of China is highly variable, both spatially and temporally. The climate is governed by a number of factors including the East Asian Monsoon (EAM), the El Niño Southern Oscillation (ENSO), a subtropical high pressure system in the western Pacific Ocean and topographic features (such as snow cover on the Tibetan Plateau) in addition to the country's sheer size and geographical diversity (Qian *et al.*, 2006; Tao *et al.*, 2004; Xie *et al.*, 2014). Among these factors, the EAM is a strong influence on the climate especially when interacting with the ENSO (even though the interactions between the two are little understood) (Tao *et al.*, 2004).

China's monsoonal continental climate is characterised by large precipitation variability with cold and dry winters (October to March) giving way to a rain belt that moves from the south to the north in the summer (April to September). During the summer months the east of the country is hot and humid while the north is considerably cooler and more arid (NDRC 2007).

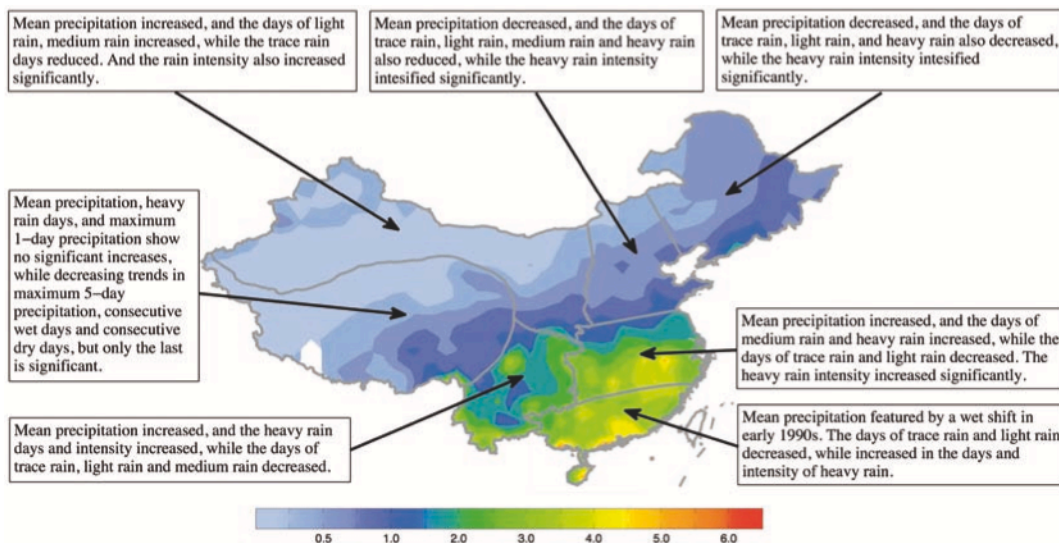
Over the last 100 years the temperature has tended to become warmer across much of the country. Historical records also indicate that there has been a distinct drying trend in Eastern and North-western China (Qian *et al.*, 2006). Looking in more detail at this increasing temperature trend, Wang *et al.* (2012) report that, in the past 60 years, the annual and seasonal maximum and minimum temperatures have increased. Upward trends have also been reported in the number of warm days and warm nights with a downward trend in the number of frost days. Owing to the earlier and greater rate of increase in the annual mean daily minimum temperature compared to the annual mean daily maximum temperature the annual mean diurnal temperature range has decreased (see Figure A6-1 for a summary of the key changes). The frequency of heat wave events and hot days has increased over much of China with the 1990s witnessing a remarkable rise in the number of hot events in all regions but particularly Eastern and North-western China.

Figure A6-1: Observed changes in temperature extremes predominantly over the last 50 years. Shading is the annual mean temperature in the period 1980 – 2009 in degrees Celsius (from Wang, H.-J. *et al.*, 2012: 283).



Wang *et al* (2012) state that there has been a general increase in mean annual precipitation for most of China excluding the central north and northeast of the country. The increase in the east of the country has occurred mainly in the summer whilst the drying trend in the north occurred predominantly in the spring and autumn. In the west of the country the increasing trend has occurred across all of the seasons (key features are summarised in Figure A6-2). Over the majority of China the ratio of heavy precipitation events to total precipitation has increased suggesting that the precipitation is falling in more intense bursts. In the south of China and the middle and lower reaches of the Yangtze, increases in heavy precipitation were observed in the summer months with decreases in the autumn and winter. Of recent note has been the shift of the summer monsoon circulation from a strong to a weak state that has resulted in increased summer precipitation in the south and decreases in precipitation in the north. As a result, China has experienced the twin threats of floods (in the south) and droughts (in the north) concurrently but in different parts of the country.

Figure A6-2: Observed changes in precipitation extremes predominantly over the last 50 years. Shading is the annual mean precipitation in the period 1980 – 2009 in millimetres per day (from Wang, H.-J. *et al.*, 2012: 285).



Extreme events

In 2013, almost 5.5 million people were displaced in China due to weather-related⁹⁷ and geophysical hazard⁹⁸ events, predominantly storms, floods, and earthquakes (but not including droughts). Over the 2008 – 2013 period, hazards such as floods and storms have led to approximately 54.25 million people being forced out of their homes in China, approximately one third the global displacement total (Yonetani, 2014). Globally, weather-related hazards accounted for 94 per cent of the 2013 total number of people displaced and 85 per cent of all displacement since 2008. Agriculturally, Shuai *et al* (2013: 134; citing Wang *et al.* 2007) state that, on average, approximately 31 per cent of cultivated areas are affected annually by meteorological disasters with droughts (56 per cent) and floods (24 per cent) the most common. Simelton *et al* (2011), focusing purely on floods and droughts, present analysis that shows the average annual impact on sown areas⁹⁹ is 31 per cent for the period 1995 to 2008. For this period, Anhui reported an average annual impact of 30 per cent with an average sensitivity¹⁰⁰ of 44 and 50 per cent for drought and flood respectively.

⁹⁷ Includes storms (tropical, winter, tornados, snow and sand), floods (flash, coastal, riverine, snow melt, dam releases), wet mass movements (landslides, avalanches and sudden subsistence), extreme temperature and wild fires. The figures do not include displacement due to drought, desertification or coastal erosion (Yonetani, 2014: 50).

⁹⁸ Includes earthquakes and tsunamis, volcanic eruptions and associated processes and dry mass movements (rock falls, landslides, avalanches, sudden subsistence) (Yonetani, 2014: 50)

⁹⁹ Impact is determined by calculating the average area impacted by a natural disaster as a percentage of the total sown area (Simelton, 2011: 42).

¹⁰⁰ Average sensitivity is determined by calculating the share of the disaster area that renders more than 30 per cent crop failure (Simelton, 2011: 42).

Droughts are a key risk to continued food security and the agricultural sector more generally; they occur frequently in China often with devastating economic, social and environmental impacts (Smit and Cai, 1996). Annually, over 21 million hectares of land are affected (approximately one sixth of the total) on average by drought and this represents approximately 60% of the total land area affected by natural hazards (Wu *et al.*, 2011). Annual grain losses due to drought are put at approximately 10 billion kilograms per year and between 2004 and 2007 drought costs China 51 billion RMB (\$8 billion) in direct economic losses (Wu *et al.*, 2011; Zhang *et al.*, 2012). Typically, provinces in the northwest and northeast of China are most affected by drought events (Zhang, Qiang *et al.*, 2012).

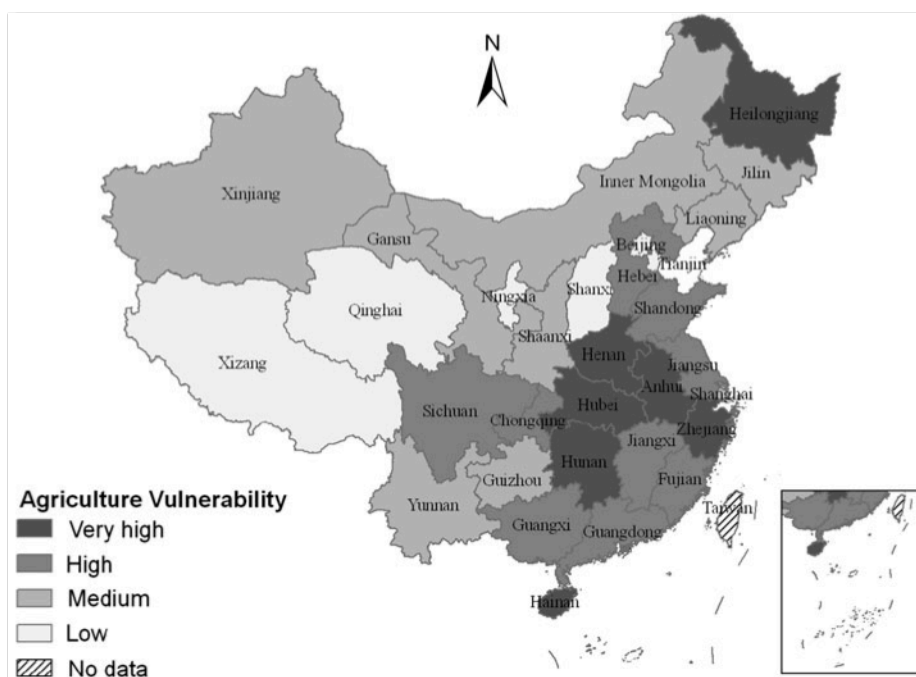
Flooding in China is predominantly associated with heavy precipitation although a minority of flood events are linked to melt water from the Tibetan Plateau. From 2001 to 2010 major flood events occurred in 2003, 2005, 2006 and 2010. Cumulatively, these four flood events affected almost 18 million hectares of farmland and 211 million people, killing 3,222. Direct economic losses were estimated to be 374,543 million RMB (Huang *et al.*, 2012: 1576). Geographically, approximately 740,000 km² of Eastern China is considered most at risk from flood events and includes Anhui, Hubei, Hunan, Jiangxi, Zhejiang, Fujian and Guangdong (Zhang, Qiang *et al.*, 2012). This part of China corresponds to approximately 40 per cent of the country's population, 35 per cent of the total arable land and 60 per cent of the country's fixed assets (Xie *et al.*, 2014: 1074).

Huang *et al* (2012) present analysis of data from 2001 to 2010¹⁰¹ that shows the agricultural vulnerability of provinces to flooding (see Figure A6-3). The vulnerability index was calculated using input – output data envelope analysis method. Two inputs are used in the analysis: flood hazard, derived from the proxy of rate of crop area covered and is calculated by dividing the crop area covered (sown area where yield has decreased by more than 10 per cent due to the flood) by total sown area; and exposure (total sown area). The output is the crop area affected (sown area of crops for which yield has decreased by more than 30 per cent as a result of the flood). The efficiency index provides the vulnerability measure. Classification groups were calculated according to the mean and standard deviation of the statistics processed (very high: 0.883 – 1.000; high: 0.587 – 0.882; medium: 0.291 – 0.586; and low: 0.034 – 0.290). The majority of the provinces identified as having a high or very high vulnerability are located mainly in the East and South-east of China and include very

¹⁰¹ Data is drawn from Journal of China Flood & Drought Management (State Flood Control & Drought Relief Headquarters 2002, 2004: 2006; Xu 2003, 2007; Zhang 2008; Yan 2009 and Bulletin of Flood and Drought Disasters in China (State Flood Control & Drought Relief Headquarters, Ministry of Water Resources of the PRC 2011a and b and China Statistical Yearbooks 2002: 2011).

significant crop growing provinces. For example, the top ten provinces in terms of total sown area, contributing 58.8 per cent of the total for China, are all identified as having high or very high vulnerability and includes Anhui (Simelton, 2011: 43; using data from China Statistical Yearbooks for 2006).

Figure A6-3: Agricultural vulnerability to floods from Huang *et al* (2012: 1581)



In this section I have shown that there has been a general increase in the temperature trend over the last 100 years. This increasing temperature trend has been more pronounced in the mean daily minimum than the mean daily maximum temperature resulting in a decrease in the mean diurnal range. There has been a general increase in the amount of precipitation although the timing of the increase varies spatially and temporally. Furthermore the character of the precipitation has changed, becoming more intense. Extreme events affect a large proportion of rural China. The two most common and severe extreme events are droughts and flooding (in terms of their spatial extent and amount of damage). Drought and flooding are prevalent in Anhui, the province sits on the dividing line between the drier north that is more commonly affected by droughts and the wetter south that it more commonly affected by floods.

Future climate change

The future climate in China is expected to become hotter and wetter with the precipitation intensity also expected to increase on a country scale. However, the range of uncertainties is large that make predicting the climate on a local scale at a specific point in the future difficult. This is especially the case when dealing with impacts and some climatic events such as heavy rainfall that are not well simulated in

climate models. That said, most models agree on the sign of climate change and indicate that it will have a neutral or slightly positive impact on agricultural production overall especially if the impact of carbon dioxide fertilization is taken into account. The neutral or positive changes at a country scale do mask considerable variation at finer spatial scales where the impacts of more intense or changing frequencies of extreme events will be felt first hand. Farmers will need to be adaptable and resilient to cope with these impacts.

Key trends and sources of uncertainty

China's National Climate Change Programme prepared by the National Development and Reform Commission (NDRC) in 2007 states that temperature has already increased by between 0.5°C and 0.8°C over the past 100 years with most of the increase occurring in the last 50 years. Precipitation shows less uniform changes in trends over the past 100 years with considerable variation within and between different regions of China (for a more detailed description of the changes see Li *et al.*, 2011). The prevalence of extreme events has increased: droughts have occurred more frequently in the North and North East and floods in the middle and lower reaches of the Yangtze and South China have become more severe (NDRC, 2007: 5). Sea level along the coast of China has risen at a rate of 2.5 mm per annum (slightly above the global average) and the mountain glaciers are showing signs of retreat (although there is considerable uncertainty that limits understanding of past and future behaviour) (Bamber, 2012).

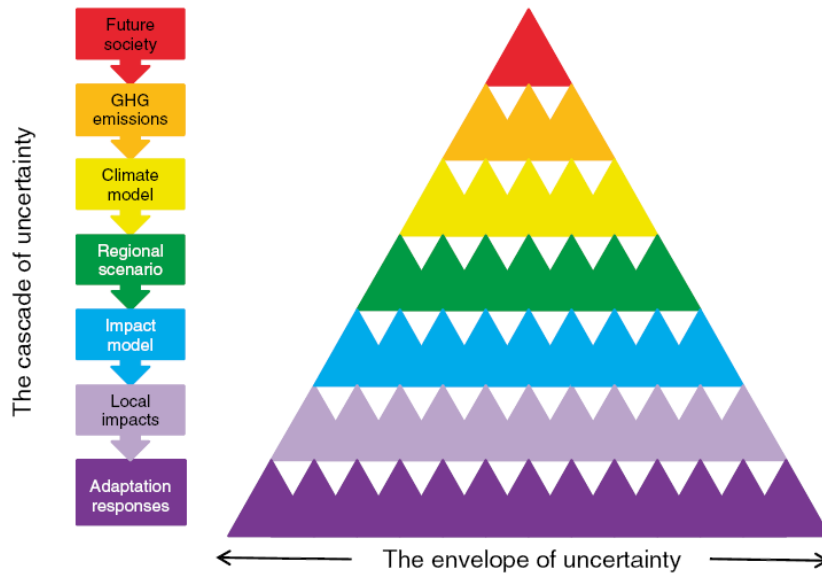
The NDRC report states that the warming trend is likely to continue and will intensify in magnitude from South to North. Precipitation is projected to increase from 2000 to 2050 by approximately 5 to 7 per cent. The possibility of more extreme events such as droughts and floods will also increase up to 2050 (2007: 5). Table A6-1 provides an overview of climate impacts for China (ranked in order of confidence) and sources of additional information.

Table A6-1: Projections of climate and associated variables ranked subjectively in decreasing order of confidence (from Li et al., 2011: 87)

Confidence	Climate variable	Changes in China
High	Atmospheric CO ₂ concentration	As IPCC SRES A2 and B2 emissions
	Global mean sea level	See IPCC AR4
	Global mean temperature	See IPCC AR4
	Regional seasonal temperature	China warms by: 2020s, A2: 1.3°C, B1: 1.2°C (Xiong et al. 2008a) 2050s, A2: 2.4°C, B1: 1.9°C (Xiong et al. 2008a) (Average of 23 climate models) Warming is most rapid in the north and west and slowest in the south
	Regional temperature extremes	Higher maximum temperatures, longer growing season (based on temperature)
Medium-high	Regional precipitation	Across China precipitation generally shows modest increases, up to ~10% by the 2080s
	Regional seasonal precipitation	Precipitation tends to increase in the west, north and northeast, slight decreases in the south and east
Medium	Precipitation extremes	Daily extreme precipitation amounts likely to increase
	Regional potential evapotranspiration	Higher temperatures could lead to higher rates of evaporation and, assuming other influences remain unchanged, higher rates of surface water evaporation and higher soil moisture deficits
Low	Changes in other extremes (e.g. cyclones)	See IPCC AR4
Very low or Unknown	Climate surprises (e.g. disintegration of the West Antarctic Ice Sheet)	Examples for China could include rapid glacial melt in the west, rapid changes to permafrost

The differing levels of confidence associated with the climate variables highlighted in the table above are due to a number of factors. In climate modelling there are three main causes of uncertainty. First, our understanding of the climate system will never be complete owing to its complexity and chaotic characteristics. For example the effects of cloud cover under warmer conditions or the role of aerosols in the atmosphere are not well represented in climate models. Second, the innate unpredictability of the chaotic climate system makes future prediction problematic. Third, humans are part of the future and choices made in 50 or 100 years are not predictable in the scientific sense (Hulme, 2009; Solomon *et al.*, 2007). These three broad groupings of uncertainty tend to compound (see Figure A6-4) and is often more pronounced when moving from a global to local scale and from cause to impact (Wilby and Dessai, 2010).

Figure A6-4: A cascade of uncertainty showing the steps required to predict future impacts. The increasing numbers of triangles at each level symbolize the growing number of permutations and hence expanding envelope of uncertainty (from Wilby and Dessai, 2010).



Despite significant improvements in the representation of the globe and ever more powerful models, the modelling of impacts at a finer spatial scale continues to prove problematic. Certain types of information are not well represented, if at all, and include issues associated with complex topography, orographic effects, local and regional circulation patterns, cloud formation and land-use distribution (Christensen *et al.*, 2007; Themeßl *et al.*, 2011). Furthermore, regional climate model projections are highly dependent on global climate model inputs for their initialisation (Gu *et al.*, 2012). As such, it is difficult to produce robust information on local changes in means and the frequency and intensity of extremes (Coumou and Rahmstorf, 2012; Goodess, 2013). For China, the issues highlighted above are particularly acute owing to the complex topography of the Tibetan Plateau and associated orographic effects and the intense and highly localised nature of much of the precipitation (as a result of the continental monsoonal climate) and other more extreme events for example (Gu *et al.*, 2012; Turner and Annamalai, 2012).

Moving from modelling of the climate to future impacts adds a further layer of uncertainty. With regard to agriculture, the main causes of the variation in projected impacts is attributed to the scenarios employed to describe the future, differences in crop models used (econometric, empirical or process-based), previously discussed issues with global circulation models and regional downscaling, the inclusion or exclusion of the effects of carbon dioxide fertilization, ozone exposure and nitrogen stress, representations of extreme events, assumptions related to the modelling of

impacts, water availability and the incorporation of adaptive practices (Asseng *et al.*, 2013; Li *et al.*, 2011; Li *et al.*, 2009; Müller *et al.*, 2010; Piao *et al.*, 2010; Rosenzweig *et al.*, 2014; Tao *et al.*, 2009; Xiong *et al.*, 2009).

Future climate and agricultural impacts

The variation in approaches used to study the future impacts of climate change on crop production means intermodal comparisons should be treated with caution, especially in regard to the specific numerical outputs. Despite this, conclusions can be drawn concerning general areas of agreement or disagreement providing useful insight about probable future changes and continuing areas of uncertainty (Rosenzweig *et al.*, 2014). A number of studies of the impacts of climate change on agricultural productivity have been produced for China over the last 20 years. Rosenzweig *et al.* (2014) compared relative changes in yield between 1980 – 2010 baseline and 2070 – 2099 period using a multi global gridded crop model ensemble and multi global climate model ensemble. The study concluded that the sign for changes in China for maize, wheat, rice and soy was predominantly neutral or positive. Furthermore, the strength of the sign tended to become more positive in northern latitudes for wheat and rice especially. The effect of carbon dioxide fertilization was included in the study.

Xiong *et al.* (2009) undertook a comprehensive integrated analysis using regional scenarios (developed from SRES scenarios A2 and B2) to assess the impact of climate change on rice, wheat and maize. The study showed that, without carbon dioxide fertilization, overall crop production decreased under scenario B2 but increased under scenario A2. For specific crops, rice decreased under A2 but increased under B2, wheat increased in all cases and maize decreased in all cases. With carbon dioxide fertilization, production increased for all crops under both scenarios supporting the more recent work of Rosenzweig *et al.* (2014) (above) who found broadly positive impacts of climate change. Xiong *et al.* (2009) concluded that the impact of carbon dioxide is a key variable; water availability has the potential to seriously constrain crop production as does the conversion of agricultural land to other uses.

The latter point, regarding the importance of land conversion, is supported in a study undertaken by Tao *et al.* (2009). The study used four SRES scenarios (A1, A2, B1 and B2) to model changing demographic and socio-economic conditions in China. These scenarios were used to explore the impact of climate change on crop productivity. Tao *et al.* highlighted that the total amount of cropland area and the amount of this cropland that was used for cereal crops strongly influenced the total amount of cereal crops produced offsetting any gains or losses in production associated with climate change.

Müller *et al* (2010) used an ensemble of global circulation models initialised with the SRES A1b, A2 and A1 scenarios to drive a regional dynamic vegetation model to explore the impacts of climate change and carbon dioxide fertilization. The analysis compared changes in total crop production between the reference period of 1996 – 2005 and 2046 – 2055 and was undertaken for regions of the world. The study concluded that for China and centrally planned Asia there would be a small positive change in yield with food self-sufficiency decreasing slightly due to the offsetting impact of population growth. These findings parallel those of Rosenzweig *et al* (2014) and Tao *et al* (2009) in highlighting the significance of factors not associated with climate change in the changes and impacts of crop production (in this case population growth).

Piao *et al* (2010) reviewed results of four crop assessment studies and concluded that cereal production is predicted to increase. Geographically, the most notable increases are likely to occur in northeast, northwest and southeast coastal provinces. In Eastern China, by 2050, rice and winter wheat are projected to increase by 7 and 25 per cent (respectively) whereas irrigated maize could decrease. The increases in some parts of northern China are evident in the more recent work undertaken by Rosenzweig *et al* (2014), whereas predicted changes for the southeast and eastern provinces are not replicated. As with the other studies discussed above, the effect of carbon dioxide fertilization was large. Overall, crop production could decrease by approximately 13 per cent by 2050. For specific crops the removal of the impact of carbon dioxide fertilization is predicted to reduce yields for rice of between 4 to 14 per cent, for wheat of between 2 to 20 per cent and between 0 to 23 per cent for maize by 2050. Interestingly, Piao *et al* (2010) draw out the difference in production between irrigated (greater improvement or less reduction) and rain-fed (less improvement or greater reduction) agriculture in the crop studies.

The brief review of crop impact studies suggests that the impact of climate change on agricultural production will be broadly neutral or slightly positive at a country level *ceteris paribus*. Most studies seem to agree that the distribution of agricultural production will change (shifting northwards). The impact of carbon dioxide fertilization within the models is very important and often determines the sign of the change or the size of the change. The role of other drivers such as the amount of land used for crop production, the availability of water and the impact of population growth were often as important if not more so, than the projected impact on agriculture associated solely with climate change. Reports by Xie *et al* (2009) for the World Bank and Zhang *et al* (2012) for the Asia Development Bank highlight water scarcity as a significant issue for much of Asia and a great source of uncertainty. China's growing population, which is

predicted to peak between 1.350 and 1.507 billion¹⁰², also complicates the picture (Peng, 2011). The increasing population will place additional demands on already scarce resources through changes in consumption patterns and behaviours (Xie *et al.*, 2009; Zhao *et al.*, 2008).

Most models indicate that the likely impact of climate change over the next 100 years is likely to be neutral or slightly positive for China although caution should be exercised in reading too much into these results. For example, in one study, Li *et al* (2009) developed a Drought Risk Index to explore the impact of drought using conditions provided by an ensemble of global climate models. Li *et al* (2009) found that, although there was a high degree of consistency in projecting the sign of the changes, the standard deviation for drought disaster frequency was very high for China - exceeding 100%. This suggests that the models are not agreeing on the frequency of increase for droughts in China. Problems with replicating extreme events and the large degree of uncertainty associated with impact modelling make predictions about the future notoriously difficult. Furthermore the inclusion or otherwise of the effects of carbon dioxide fertilisation are key in determining a significant proportion of the variance in the models

Although the impact of climate change on agriculture has been limited to date and models suggest that, overall, change is neutral or slightly positive. Despite the overall neutral or slightly positive impacts considerable variation will occur at a sub-national level. Climate change will cause changes in the distribution of crop growing areas, the frequency of harvests will change and losses associated with extremes is likely to persist or increase. Farmers will need to become more adaptable to cope with these changes and there will be winners (increased growing area in the north) and losers (reduced rice yield in south owing to increases in temperature). Piao *et al* argue that the impact of climate change will be a major force that 'China ... will have to cope with in the twenty-first century' (2010: 43) and Zhang *et al* posit that the recent severe droughts in the Southwest of the country and the middle and lower reaches of the Yangtze are the 'new normal' (2012: 5)¹⁰³. The changes on the ground on a day-to-day basis, rather than national or regional annual changes in mean production output, will be the most important in terms of impact on people's lives and these cannot be modelled with any certainty.

¹⁰² The timing of the peak remains open to conjecture but it is likely to occur sometime before 2050 (Peng, 2011).

¹⁰³ For a more general discussion on stationarity and the impact of climate change see Milly *et al* (2008).

9 Glossary

AI	Asset Index
ASL	Above Sea Level
C. of V.	Coefficient of Variance
DD	Dongdian
EACH-FOR	Environmental Change and Forced Migration Scenarios
GIS	Geographic Information Systems
G.S.	Growing Season
NELM	New Economics of Labour Migration
O	Other interviewee (not the main respondent)
PCA	Principle Components Analysis
PRA	Participatory Rural Appraisal
RA	Research Assistant
RMB	Renminbi
RRA	Rapid Rural Appraisal
S.D.	Standard Deviation
WZ	Wanzhuang

10 References

- Adey, P. 2010. *Mobility* London: Routledge.
- Adger, W. N. 2000. Social and Ecological Resilience: Are They Related? *Progress in Human Geography*, 24 (3), 347-364.
- Adger, W. N. 2003. Building Resilience to Promote Sustainability. IDHP Update, Issue, 20. Bonn, Germany: International Human Dimensions Programme on Global Environmental Change.
- Adger, W. N. 2006. Vulnerability. *Global Environmental Change-Human and Policy Dimensions*, 16 (3), 268-281.
- Adger, W. N. & Adams, H. 2013. Migration as an Adaptation Strategy to Environmental Change. *World Social Science Report 2013: Changing Global Environments*: OECD Publishing/Unesco Publishing, 261, 264. pp.
- Adger, W. N., Eakin, H. & Winkels, A. 2009a. Nested and Teleconnected Vulnerabilities to Environmental Change. *Frontiers in Ecology and the Environment*, 7 (3), 150-157.
- Adger, W. N., Huq, S., Brown, K., Conway, D. & Hulme, M. 2003. Adaptation to Climate Change in the Developing World. *Progress in Development Studies*, 3 (3), 179-195.
- Adger, W. N. & Kelly, P. M. 1999. Social Vulnerability to Climate Change and the Architecture of Entitlements. *Mitigation and Adaptation Strategies for Global Change*, 4 (3), 253-266.
- Adger, W. N., Kelly, P. M., Winkels, A., Huy, L. Q. & Locke, C. 2002. Migration, Remittances, Livelihood Trajectories, and Social Resilience. *Ambio*, 31 (4), 358-366.
- Adger, W. N., Lorenzoni, I. & O'Brien, K. L. 2009b. *Adapting to Climate Change : Thresholds, Values, Governance* Cambridge ; New York: Cambridge University Press.
- Adger, W. N., Pulhin, J. M., Barnett, J., Dabelko, G. D., Hovelsrud, G. K., Levy, M., Oswald Spring, Ú. & Vogel, C. H. 2014. Human Security. *In*: Field, C. B., Barros, V. R., Dokken, D. J., Mach, K. J., Mastrandrea, M. D., Bilir, T. E., Chatterjee, M., Ebi, K. L., Estrada, Y. O., Genova, R. C., Girma, B., Kissel, E. S., Levy, A. N., Maccracken, S., Mastrandrea, P. R. & White, L. L. (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 of Climate Change* Cambridge, United Kingdom and New York, NY, USA: Cambridge University Press, 755, 791. pp.

- Agrawal, A. & Perrin., N. 2009. Climate Adaptation, Local Institutions and Rural Livelihoods. *In: Adger, W. N., Lorenzoni, I. & O'brien, K. L. (eds.) Adapting to Climate Change: Thresholds, Values, Governance* Cambridge ; New York: Cambridge University Press, 350, 367. pp.
- Ahmad, E. 2007. The Political Economy of Designing Programs to Reach the Poorest. *In: Ahmad, E. (ed.) Fiscal Policy Instruments and the Political Economy of Designing Programs to Reach the Poorest* Washington: International Food Policy Research Institute, 237, 251. pp.
- Ajibade, I., McBean, G. & Bezner-Kerr, R. 2013. Urban Flooding in Lagos, Nigeria: Patterns of Vulnerability and Resilience among Women. *Global Environmental Change*, 23 (6), 1714-1725.
- Aleksandrova, M., Lamers, J. P. A., Martius, C. & Tischbein, B. 2014. Rural Vulnerability to Environmental Change in the Irrigated Lowlands of Central Asia and Options for Policy-Makers: A Review. *Environmental Science & Policy*, 10.1016/j.envsci.2014.03.001.
- Allison, E. H. & Ellis, F. 2001. The Livelihoods Approach and Management of Small-Scale Fisheries. *Marine Policy*, 25 (5), 377-388.
- Allison, P. D. 1984. *Event History Analysis : Regression for Longitudinal Event Data* Beverly Hills ; London: Sage.
- Appave, G. & Laczko, F. (eds.) 2005. *Migration, Development and Poverty Reduction in Asia* International Organisation for Migration.
- Armitage, D., Béné, C., Charles, A. T., Johnson, D. & Allison, E. H. 2012. The Interplay of Well-Being and Resilience in Applying a Social-Ecological Perspective. *Ecology and Society*, 17 (4), n/a-n/a.
- Asian Development Bank 2011. *Asia 2050: Realizing the Asian Century*. Manila: Asian Development Bank, 127.
- Asseng, S., Ewert, F., Rosenzweig, C., Jones, J. W., Hatfield, J. L., Ruane, A. C., Boote, K. J., Thorburn, P. J., Rotter, R. P., Cammarano, D., Brisson, N., Basso, B., Martre, P., Aggarwal, P. K., Angulo, C., Bertuzzi, P., Biernath, C., Challinor, A. J., Doltra, J., Gayler, S., Goldberg, R., Grant, R., Heng, L., Hooker, J., Hunt, L. A., Ingwersen, J., Izaurralde, R. C., Kersebaum, K. C., Mueller, C., Kumar, S. N., Nendel, C., O'Leary, G., Olesen, J. E., Osborne, T. M., Palosuo, T., Priesack, E., Ripoche, D., Semenov, M. A., Shcherbak, I., Steduto, P., Stoeckle, C., Stratonovitch, P., Streck, T., Supit, I., Tao, F., Travasso, M., Waha, K., Wallach, D., White, J. W., Williams, J. R. & Wolf, J. 2013. Uncertainty in Simulating Wheat Yields under Climate Change. *Nature Climate Change*, 3 (9), 827-832.

- Attane, I. 2002. China's Family Planning Policy: An Overview of Its Past and Future. *Studies in Family Planning*, 33 (1), 103-113.
- Australian National University, University of Queensland, Beijing Normal University & Institute for the Study of Labor 2009. Rural-Urban Migration in China, 2008.
- Babiarz, K. S., Miller, G., Yi, H., Zhang, L. & Rozelle, S. 2010. New Evidence on the Impact of China's New Cooperative Medical Scheme and Its Implications for Rural Primary Healthcare. In: *Ten Years of War Against Poverty*, Manchester, 2010.
- Bailey, A. J. 2011. Population Geographies and Climate Change. *Progress in Human Geography*, 35 (5), 686-695.
- Baird, R., Migiro, K., Nutt, D., Kwatra, A., Wilson, S., Melby, J., Pendleton, A., Rodgers, M. & Davison, J. 2007. *Human Tide: The Real Migration Crisis*. Christian Aid,,. Aid, C., 50.
- Bakewell, O. 2007. *Keeping Them in Their Place: The Ambivalent Relationship between Development and Migration in Africa*. Working papers. International Migration Institute, University of Oxford. Oxford, UK, 44 pp.
- Bakewell, O. 2010. Some Reflections on Structure and Agency in Migration Theory. *Journal of Ethnic and Migration Studies*, 36 (10), 1689-1708.
- Balen, J., McManus, D., Li, Y.-S., Zhao, Z.-Y., Yuan, L.-P., Utzinger, J., Williams, G., Li, Y., Ren, M.-Y., Liu, Z.-C., Zhou, J. & Raso, G. 2010. Comparison of Two Approaches for Measuring Household Wealth Via an Asset-Based Index in Rural and Peri-Urban Settings of Hunan Province, China. *Emerging Themes in Epidemiology*, 7 (1), 1-17.
- Bao, S., Bodvarsson, O. B., Hou, J. W. & Zhao, Y. 2009. The Deregulation of People Flows in China: Did the Structure of Migration Change? In: ASSA conference, San Francisco, 2009.
- Barbieri, A. F. & Carr, D. L. 2005. Gender-Specific out-Migration, Deforestation and Urbanization in the Ecuadorian Amazon. *Global and Planetary Change*, 47 (2-4), 99-110.
- Bardsley, D. K. & Hugo, G. J. 2010. Migration and Climate Change: Examining Thresholds of Change to Guide Effective Adaptation Decision-Making. *Population and Environment*, 32 (2-3), 238-262.
- Barnett, J. & O'Neill, S. 2010. Maladaptation. *Global Environmental Change-Human and Policy Dimensions*, 20 (2), 211-213.
- Barnett, J. & Webber, M. 2010. *Accommodating Migration to Promote Adaptation to Climate Change*. Policy Research Working Paper. World Bank. World Bank, 62.

- Bebbington, A. 1999. Capitals and Capabilities: A Framework for Analyzing Peasant Viability, Rural Livelihoods and Poverty. *World Development*, 27 (12), 2021-2044.
- Beichler, S. A., Hasibovic, S., Davidse, B. J. & Deppisch, S. 2014. The Role Played by Social-Ecological Resilience as a Method of Integration in Interdisciplinary Research. *Ecology and Society*, 19 (3), n/a-n/a.
- Bell, M., Charles-Edwards, E., Kupiszewska, D., Kupiszewski, M., Stillwell, J. & Zhu, Y. 2014. Internal Migration Data around the World: Assessing Contemporary Practice. *Population, Space and Place*, 10.1002/psp.1848.
- Béné, C., Evans, L., Mills, D., Ovie, S., Raji, A., Tafida, A., Kodio, A., Sinaba, F., Morand, P., Lemoalle, J. & Andrew, N. 2011. Testing Resilience Thinking in a Poverty Context: Experience from the Niger River Basin. *Global Environmental Change*, 21 (4), 1173-1184.
- Béné, C., Godfrey Wood, R., Newsham, A. & Davies, M. 2012. *Resilience: New Utopia or New Tyranny? Reflection About the Potentials and Limits of the Concept of Resilience in Relation to Vulnerability Reduction Programmes*. Institute of Development Studies. Brighton: Institute of Development Studies, 61.
- Béné, C., Newsham, A., Davies, M., Ulrichs, M. & Godfrey-Wood, R. 2014. Review Article: Resilience, Poverty and Development. *Journal of International Development*, 26 (5), 598-623.
- Bennett, N. J., Dearden, P., Murray, G. & Kadfak, A. 2014. The Capacity to Adapt?: Communities in a Changing Climate, Environment, and Economy on the Northern Andaman Coast of Thailand. *Ecology and Society*, 19 (2), n/a-n/a.
- Berkes, F., Colding, J. & Folke, C. (eds.) 2003. *Navigating Social-Ecological Systems : Building Resilience for Complexity and Change* Cambridge ; New York: Cambridge University Press.
- Berkes, F. & Ross, H. 2013. Community Resilience: Toward an Integrated Approach. *Society & Natural Resources*, 26 (1), 5-20.
- Berkhout, F., Leach, M. & Scoones, I. 2003. *Negotiating Environmental Change: New Perspectives from Social Science* Cheltenham: Edward Elgar.
- Biao, X. 2007a. How Far Are the Left-Behind Left Behind? A Preliminary Study in Rural China. *Population, Space and Place*, 13 (3), 179-191.
- Biao, X. 2007b. The Making of Mobile Subjects: How Migration and Institutional Reform Intersect in Northeast China. *Development*, 50 (4), 69-74.
- Biggs, E. M., Tompkins, E. L., Allen, J., Moon, C. & Allen, R. 2013. Agricultural Adaptation to Climate Change: Observations from the Mid-Hills of Nepal. *Climate and Development*, 10.1080/17565529.2013.789791, 1-9.

- Bilsborrow, R. 2009. Collecting Data on the Migration– Environment Nexus. *In: Laczko, F. & Aghazarm, C. (eds.) Migration, Environment and Climate Change: Assessing the Evidence* Geneva, Switzerland: International Organization for Migration, 113, 196. pp.
- Bilsborrow, R. E., Oberi, A. S. & Standing, G. 1984. *Migration Surveys in Low-Income Countries : Guidelines for Survey and Questionnaire Design* London: Croom Helm.
- Birkenholtz, T. 2011. Network Political Ecology: Method and Theory in Climate Change Vulnerability and Adaptation Research. *Progress in Human Geography*, 10.1177/0309132511421532.
- Black, R. 2001. *Environmental Refugees: Myth or Reality* University of Sussex. Brighton: United Nations High Commissioner for Refugees, 19.
- Black, R. 2011. Migration and Global Environmental Change. *Global Environmental Change*, 21 (Supplement 1), S1-S2.
- Black, R., Adger, W. N., Arnell, N. W., Dercon, S., Geddes, A. & Thomas, D. 2011a. The Effect of Environmental Change on Human Migration. *Global Environmental Change*, 21 (SUPPL. 1), S3-S11.
- Black, R., Arnell, N. W., Adger, W. N., Thomas, D. & Geddes, A. 2013. Migration, Immobility and Displacement Outcomes Following Extreme Events. *Environmental Science & Policy*, 27, Supplement 1, S32-S43.
- Black, R., Bennett, S. R. G., Thomas, S. M. & Beddington, J. R. 2011b. Comment: Migration as Adaptation. *Nature*, 478 (7370), 447-449.
- Black, R., Kniveton, D. & Schmidt-Verkerk, K. 2011c. Migration and Climate Change: Towards an Integrated Assessment of Sensitivity. *Environment and Planning A*, 43 (2), 431-450.
- Black, R. & Sward, J. 2008. Measuring the Migration-Development Nexus: An Overview of Available Data. Brighton: Development Research Centre on Migration, Globalisation and Poverty,, 1-4.
- Blaikie, P. M. 1994. *At Risk : Natural Hazards, People's Vulnerability, and Disasters:* London : Routledge.
- Blaikie, P. M. & Brookfield, H. C. 1987. *Land Degradation and Society* London: London : Methuen.
- Bohle, H. G., Downing, T. E. & Watts, M. J. 1994. Climate-Change and Social Vulnerability - toward a Sociology and Geography of Food Insecurity. *Global Environmental Change-Human and Policy Dimensions*, 4 (1), 37-48.
- Bonfiglio, A. Year. Conceptualising Environmental Change and Global Migration Futures. *In: Environmental Change and Global Migration Futures Expert*

- Workshop, 21 - 22 June 2012 2012 Oxford, England. International Migration Institute, University of Oxford, 15 pp.
- Boyle, P. J., Halfacree, K. & Robinson, V. 1998. *Exploring Contemporary Migration* Harlow: Longman.
- Brand, F. S. & Jax, K. 2007. Focusing the Meaning(S) of Resilience: Resilience as a Descriptive Concept and a Boundary Object. *Ecology and Society*, 12 (1), n/a-n/a.
- Brettell, C. & Hollifield, J. F. (eds.) 2000. *Migration Theory : Talking across Disciplines* New York: Routledge.
- Brown, K. 2014. Global Environmental Change I: A Social Turn for Resilience? *Progress in Human Geography*, 38 (1), 107-117.
- Brown, K. & Westaway, E. 2011. Agency, Capacity, and Resilience to Environmental Change: Lessons from Human Development, Well-Being, and Disasters. In: Gadgil, A. & Liverman, D. M. (eds.) *Annual Review of Environment and Resources, Vol 36* Palo Alto: Annual Reviews, 321, 342. pp.
- Brown, O. 2008. *Migration and Climate Change*. Research paper. International Organization for Migration,,. Geneva: International Organization for Migration, 1-64 pp.
- Brown, P. H., de Brauw, A. & Du, Y. 2009. Understanding Variation in the Design of China's New Co-Operative Medical System. *The China Quarterly*, 198, 304-329.
- Bryman, A. 2008. *Social Research Methods* Oxford: Oxford University Press.
- Cai, Q. 2003. Migrant Remittances and Family Ties: A Case Study in China. *International Journal of Population Geography*, 9 (6), 471-483.
- Cao, K. H. & Birchenall, J. A. 2013. Agricultural Productivity, Structural Change, and Economic Growth in Post-Reform China. *Journal of Development Economics*, 104, 165-180.
- Caretta, M. A. 2014. Situated Knowledge in Cross-Cultural, Cross-Language Research: A Collaborative Reflexive Analysis of Researcher, Assistant and Participant Subjectivities. *Qualitative Research*, 10.1177/1468794114543404.
- Carney, D. 1998. Implementing the Sustainable Rural Livelihoods Approach. In: Department for International Development Natural Resource Advisers' Conference, London, 1998. Department for International Development.
- Carpenter, S., Walker, B., Anderies, J. M. & Abel, N. 2001. From Metaphor to Measurement: Resilience of What to What? *Ecosystems*, 4 (8), 765-781.
- Carpenter, S. R. & Brock, W. A. 2004. Spatial Complexity, Resilience, and Policy Diversity: Fishing on Lake-Rich Landscapes. *Ecology and Society*, 9 (1), n/a-n/a.

- Carr, E. R. 2005. Placing the Environment in Migration: Environment, Economy, and Power in Ghana's Central Region. *Environment and Planning A*, 37 (5), 925-946.
- Carter, C. A., Zhong, F. & Zhu, J. 2012. Advances in Chinese Agriculture and Its Global Implications. *Applied Economic Perspectives and Policy*, 34 (1), 1-36.
- Carter, M. R. & Barrett, C. B. 2006. The Economics of Poverty Traps and Persistent Poverty: An Asset-Based Approach. *The Journal of Development Studies*, 42 (2), 178-199.
- Carter, M. R., Little, P. D., Mogues, T. & Negatu, W. 2007. Poverty Traps and Natural Disasters in Ethiopia and Honduras. *World Development*, 35 (5), 835-856.
- Cassidy, L. & Barnes, G. D. 2012. Understanding Household Connectivity and Resilience in Marginal Rural Communities through Social Network Analysis in the Village of Habu, Botswana. *Ecology and Society*, 17 (4), n/a-n/a.
- Castaldo, A., Deshingkar, P. & McKay, A. 2012. *Internal Migration, Remittances and Poverty: Evidence from Ghana and India*. Sussex: University of Sussex, 44.
- Castles, S. 2010. Understanding Global Migration: A Social Transformation Perspective. *Journal of Ethnic and Migration Studies*, 36 (10), 1565-1586.
- Castles, S. 2011. Concluding Remarks on the Climate Change-Migration Nexus. In: Piguet, É., Pécod, A. & Guchteneire, P. F. a. D. (eds.) *Migration and Climate Change* Cambridge: Cambridge University Press, 415, 427. pp.
- Castles, S. & Miller, M. J. 2003. *The Age of Migration : International Population Movements in the Modern World (3rd ed.)*. New York: Guilford Press.
- CEDEM 2009. *Three Gorges Dam Case Study Report*. EACH-FOR. 35 p.
- Challinor, A. J., Ewert, F., Arnold, S., Simelton, E. & Fraser, E. D. G. 2009. Crops and Climate Change: Progress, Trends, and Challenges in Simulating Impacts and Informing Adaptation. *Journal of Experimental Botany*, 60 (10), 2775-2789.
- Challinor, A. J., Wheeler, T. R., Slingo, J. M. & Hemming, D. 2005. Quantification of Physical and Biological Uncertainty in the Simulation of the Yield of a Tropical Crop Using Present-Day and Doubled Co2 Climates. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 360 (1463), 2085-2094.
- Chambers, R. 1983. *Rural Development : Putting the Last First* London: Longman.
- Chambers, R. 1997. *Whose Reality Counts? : Putting the First Last* London: Intermediate Technology.
- Chambers, R. 2007. *From PRA to PLA and Pluralism: Practice and Theory*. Working Paper. Institute of Development Studies. Brighton, 39 p.
- Chambers, R. & Conway, G. R. 1992. *Sustainable Rural Livelihoods : Practical Concepts for the 21st Century*: Institute of Development Studies.

- Chan, K. W. 1996. Post-Mao China: A Two-Class Urban Society in the Making. *International Journal of Urban and Regional Research*, 20 (1), 134-150.
- Chan, K. W. 2010a. The Global Financial Crisis and Migrant Workers in China: 'There Is No Future as a Labourer; Returning to the Village Has No Meaning'. *International Journal of Urban and Regional Research*, 34 (3), 659-677.
- Chan, K. W. 2010b. The Household Registration System and Migrant Labor in China: Notes on a Debate. *Population and Development Review*, 36 (2), 357-364.
- Chan, K. W. 2011. Internal Migration in China: Trends, Geography and Policies. *Population Distribution, Urbanization, Internal Migration and Development: An International Perspective*: United Nations, 81, 110. pp.
- Chan, K. W. 2012. Migration and Development in China: Trends, Geography and Current Issues. *Migration and Development*, 1 (2), 187-205.
- Chan, K. W. 2013. China: Internal Migration. In: Ness, I. & Bellwood, P. (eds.) *The Encyclopedia of Global Human Migration* Hoboken, NJ.: Blackwell Publishing Ltd.
- Chan, K. W. & Zhang, L. 1999. The Hukou System and Rural-Urban Migration in China: Processes and Changes. *China Quarterly*, (160), 818-855.
- Chant, S. 1992. *Gender and Migration in Developing Countries* London ; New York: Belhaven Press.
- Chant, S. 1998. Households, Gender and Rural-Urban Migration: Reflections on Linkages and Considerations for Policy. *Environment and Urbanization*, 10 (1), 5-21.
- Chen, F., Liu, G. & Mair, C. A. 2011. Intergenerational Ties in Context: Grandparents Caring for Grandchildren in China. *Social Forces*, 90 (2), 571-594.
- China Meteorological Administration. 2013. *China Released Strategy of Climate Change Adaptation* [Online]. Available: http://www.cma.gov.cn/en/NewsReleases/News/201311/t20131119_231960.html [Accessed 16/01/2015].
- China Statistical Press 2009. *Anhui Statistical Yearbook*. Anhui: China Statistical Press.
- China Statistical Press 2012. *Anhui Statistical Yearbook*. Anhui: China Statistical Press.
- China Statistical Press 2013. *China Statistical Yearbook*. Beijing: China Statistical Press.
- Christensen, J. H., Carter, T. R., Rummukainen, M. & Amanatidis, G. 2007. Evaluating the Performance and Utility of Regional Climate Models: The Prudence Project. *Climatic Change*, 81, 1-6.
- Coffey, A. & Atkinson, P. 1996. *Making Sense of Qualitative Data : Complementary Research Strategies*: Thousand Oaks, Calif. ; London : Sage.

- Collinson, S. 2011. *Review of the Social Drivers of Migration*. Research report. Government Office for Science. London: Foresight, 50, p.
- Collyer, M. & King, R. 2014. Producing Transnational Space: International Migration and the Extra-Territorial Reach of State Power. *Progress in Human Geography*, 10.1177/0309132514521479.
- Cong, Z. & Silverstein, M. 2011. Intergenerational Exchange between Parents and Migrant and Nonmigrant Sons in Rural China. *Journal of Marriage and Family*, 73 (1), 93-104.
- Connelly, R., Roberts, K. & Zheng, Z. 2010. The Impact of Circular Migration on the Position of Married Women in Rural China. *Feminist Economics*, 16 (1), 3-41.
- Connelly, R., Roberts, K. & Zheng, Z. 2011. The Settlement of Rural Migrants in Urban China - Some of China's Migrants Are Not 'Floating' Anymore. *Journal of Chinese Economic and Business Studies*, 9 (3), 283-300.
- Cook, S. 2002. From Rice Bowl to Safety Net: Insecurity and Social Protection During China's Transition. *Development Policy Review*, 20 (5), 615-635.
- Cooke, B. & Kothari, U. 2001. *Participation : The New Tyranny?* London ; New York: Zed Books.
- Corbett, J. 1988. Famine and Household Coping Strategies. *World Development*, 16 (9), 1099-1112.
- Cornet, C. 2010. Fieldwork among the Dong National Minority in Guizhou, China: Practicalities, Obstacles and Challenges. *Asia Pacific Viewpoint*, 51 (2), 135-147.
- Cote, M. & Nightingale, A. J. 2012. Resilience Thinking Meets Social Theory: Situating Social Change in Socio-Ecological Systems (Ses) Research. *Progress in Human Geography*, 36 (4), 475-489.
- Coulthard, S. 2012. Can We Be Both Resilient and Well, and What Choices Do People Have? Incorporating Agency into the Resilience Debate from a Fisheries Perspective. *Ecology and Society*, 17 (1).
- Coumou, D. & Rahmstorf, S. 2012. A Decade of Weather Extremes. *Nature Clim. Change*, 10.1038/nclimate1452.
- Cox, P. 2010. Juvenile Justice Reform and Policy Convergence in the New Vietnam. *Youth Justice*, 10 (3), 227-244.
- Cresswell, T. 2006. *On the Move : Mobility in the Modern Western World* New York ; London: Routledge.
- Curran, S. 2002. Migration, Social Capital and the Environment: Considering Migrant Selectivity and Networks in Relation to Coastal Ecosystems. In: Lutz, W., Prskawetz, A., Sanderson, W. C., Population, C. & Seminar on Population and the Environment: Modelling and Simulating Their Complex, I. (eds.) *Population*

- and Environment : Methods of Analysis* New York: New York: Population Council, 89-125.
- Curran, S. R., Dyer, J. & Korinek, K. 2007. The Migration and Development Prism: A Lens on Vulnerabilities and Capabilities. *Asian and Pacific Migration Journal*, 16 (4), 443-449.
- Cutter, S. L., Boruff, B. J. & Shirley, W. L. 2003. Social Vulnerability to Environmental Hazards. *Social Science Quarterly*, 84 (2), 242-261.
- d-maps. 2014a. *Anhui Prefecture Map* [Online]. Available: http://d-maps.com/carte.php?num_car=18957&lang=en [Accessed 28/10/2014].
- d-maps. 2014b. *China Provincial Map* [Online]. Available: <http://d-maps.com/m/asia/china/chine/chine60.pdf> [Accessed 10/06/2015].
- Davidson, D. J. 2010. The Applicability of the Concept of Resilience to Social Systems: Some Sources of Optimism and Nagging Doubts. *Society & Natural Resources*, 23 (12), 1135-1149.
- Davies, P. J. 2014. 'Asian Century' Will Dominate Global Financial Markets. Financial Times [Online], Available: http://www.ft.com/cms/s/433bf1e4-be2a-11e3-b44a-00144feabdc0,Authorised=false.html?_i_location=http%3A%2F%2Fwww.ft.com%2Fcms%2Fs%2F0%2F433bf1e4-be2a-11e3-b44a-00144feabdc0.html%3Fsiteedition%3Duk&siteedition=uk&_i_referer=-axzz3GgFq5tS5 [Accessed 20/10/2014].
- Davoudi, S., Shaw, K., Haider, L. J., Quinlan, A. E., Peterson, G. D., Wilkinson, C., Fünfgeld, H., McEvoy, D. & Porter, L. 2012. Resilience: A Bridging Concept or a Dead End? "Reframing" Resilience: Challenges for Planning Theory and Practice Interacting Traps: Resilience Assessment of a Pasture Management System in Northern Afghanistan Urban Resilience: What Does It Mean in Planning Practice? Resilience as a Useful Concept for Climate Change Adaptation? The Politics of Resilience for Planning: A Cautionary Note. *Planning Theory & Practice*, 13 (2), 299-333.
- de Brauw, A., Huang, J., Rozelle, S., Zhang, L. & Zhang, Y. 2002. The Evolution of China's Rural Labor Markets During the Reforms. *Journal of Comparative Economics*, 30 (2), 329-353.
- De Haan, L. J. 2012. The Livelihood Approach: A Critical Exploration. *Erdkunde*, 66 (4), 345-357.
- De Haan, L. J. & Zoomers, A. 2005. Exploring the Frontier of Livelihoods Research. *Development and Change*, 36 (1), 27-47.
- De Jong, G. F. & Fawcett, J. T. 1981. Motivations for Migration: An Assessment and a Value-Expectancy Research Model. In: Gardner, R. W. & De Jong, G. F. (eds.) *Migration Decision Making* Oxford, UK, New York, USA: Pergamon, 13, 58. pp.

- de Sherbinin, A., VanWey, L. K., McSweeney, K., Aggarwal, R. M., Barbieri, A., Henry, S., Hunter, L. M., Twine, W. & Walker, R. 2008. Rural Household Demographics, Livelihoods and the Environment. *Global Environmental Change-Human and Policy Dimensions*, 18 (1), 38-53.
- Demurger, S. & Xu, H. 2011. Return Migrants: The Rise of New Entrepreneurs in Rural China. *World Development*, 39 (10), 1847-1861.
- Demurger, S. & Xu, H. 2013. *Left-Behind Children and Return Decisions of Rural Migrants in China*. Discussion paper. Institute for the Study of Labour. Bonn, Germany, 51. p.
- Dercon, S. & Christiaensen, L. 2011. Consumption Risk, Technology Adoption and Poverty Traps: Evidence from Ethiopia. *Journal of Development Economics*, 96 (2), 159-173.
- Dercon, S. & Krishnan, P. 2000. Vulnerability, Seasonality and Poverty in Ethiopia. *The Journal of Development Studies*, 36 (6), 25-53.
- Deryng, D., Conway, D., Ramankutty, N., Price, J. & Warren, R. 2014. Global Crop Yield Response to Extreme Heat Stress under Multiple Climate Change Futures. *Environmental Research Letters*, 9 (3), n/a-n/a.
- Deshingkar, P. Year. Maximising the Benefits of Internal Migration for Development. In: Regional conference on migration and development in Asia, 2005 Lanzhou, China. ODI, 43. p.
- Deshingkar, P. 2006. Internal Migration, Poverty and Development in Asia: Including the Excluded. *IDS Bulletin*, 37 (3), 88-100.
- Deshingkar, P. 2012. Environmental Risk, Resilience and Migration: Implications for Natural Resource Management and Agriculture. *Environmental Research Letters*, 7 (1), n/a-n/a.
- Devereux, S. 2001. Sen's Entitlement Approach: Critiques and Counter-Critiques. *Oxford Development Studies*, 29 (3), 245-263.
- Devereux, S. & Longhurst, R. 2010. Incorporating Seasonality into Agricultural Project Design and Learning. *IDS Bulletin*, 41 (6), 88-95.
- Ding, G. Y., Zhang, Y., Gao, L., Ma, W., Li, X. J., Liu, J., Liu, Q. Y. & Jiang, B. F. 2013. Quantitative Analysis of Burden of Infectious Diarrhea Associated with Floods in Northwest of Anhui Province, China: A Mixed Method Evaluation. *Plos One*, 8 (6), n/a-n/a.
- Doevenspeck, M. 2011. The Thin Line between Choice and Flight: Environment and Migration in Rural Benin. *International Migration*, 49, e50-e68.
- Dos Santos, S. & Henry, S. 2008. Rainfall Variation as a Factor in Child Survival in Rural Burkina Faso: The Benefit of an Event-History Analysis. *Population Space and Place*, 14 (1), 1-20.

- Dun, O. 2011. Migration and Displacement Triggered by Floods in the Mekong Delta. *International Migration*, 49, e200-e223.
- Dun, O. & Gemenne, F. 2008. Defining 'Environmental Migration'. *Forced Migration Review*, Issue, 10-11. Oxford: Oxford Department of International Development.
- Dwiartama, A. & Rosin, C. 2014. Exploring Agency Beyond Humans: The Compatibility of Actor-Network Theory (Ant) and Resilience Thinking. *Ecology and Society*, 19 (3), n/a-n/a.
- Eakin, H., Winkels, A. & Sendzimir, J. 2009. Nested Vulnerability: Exploring Cross-Scale Linkages and Vulnerability Teleconnections in Mexican and Vietnamese Coffee Systems. *Environmental Science & Policy*, 12 (4), 398-412.
- Eakin, H. C. & Wehbe, M. B. 2009. Linking Local Vulnerability to System Sustainability in a Resilience Framework: Two Cases from Latin America. *Climatic Change*, 93 (3-4), 355-377.
- Economy, E. 2004. *The River Runs Black : The Environmental Challenge to China's Future* Ithaca: Cornell University Press.
- El-Hinnawi, E. 1985. *Environmental Refugees*. UNEP. Kenya: UNEP.
- Ellis, F. 1998. Household Strategies and Rural Livelihood Diversification. *The Journal of Development Studies*, 35 (1), 1-38.
- Ellis, F. 2000. *Rural Livelihoods and Diversity in Developing Countries*: Oxford University Press.
- Ernstson, H., van der Leeuw, S. E., Redman, C. L., Meffert, D. J., Davis, G., Alfsen, C. & Elmqvist, T. 2010. Urban Transitions: On Urban Resilience and Human-Dominated Ecosystems. *Ambio*, 39 (8), 531-545.
- Etzold, B., Ahmed, A. U., Hassan, S. R. & Neelormi, S. 2013. Clouds Gather in the Sky, but No Rain Falls. Vulnerability to Rainfall Variability and Food Insecurity in Northern Bangladesh and Its Effects on Migration. *Climate and Development*, 10.1080/17565529.2013.833078.
- Etzold, B., Julich, S., Keck, M., Sakdapolrak, P., Schmitt, T. & Zimmer, A. 2012. Doing Institutions. A Dialectic Reading of Institutions and Social Practices and Its Relevance for Development Geography. *Erdkunde*, 66 (3), 185-195.
- Ezra, M. & Kiros, G.-E. 2001. Rural out-Migration in the Drought Prone Areas of Ethiopia: A Multilevel Analysis. *International Migration Review*, 35 (3), 749-771.
- Faist, T. 1997. The Crucial Meso-Level. In: Tomas, H., Grete, B., Kristof, T. & Thomas, F. (eds.) *International Migration, Immobility and Development: Multidisciplinary Perspectives* Oxford, UK; New York, NY, USA: Berg, 187, 217. pp.
- Fan, C. C. 2002. The Elite, the Natives, and the Outsiders: Migration and Labor Market Segmentation in Urban China. *Annals of the Association of American Geographers*, 92 (1), 103-124.

- Fan, C. C. 2004. The State, the Migrant Labor Regime, and Maiden Workers in China. *Political Geography*, 23 (3), 283-305.
- Fawcett, J. T. 1989. Networks, Linkages, and Migration Systems. *International Migration Review*, 23 (3), 671-680.
- Feng, L., Bao, H. X. H. & Jiang, Y. 2014. Land Reallocation Reform in Rural China: A Behavioral Economics Perspective. *Land Use Policy*, 41, 246-259.
- Feng, S. & Heerink, N. 2008. Are Farm Households' Land Renting and Migration Decisions Inter-Related in Rural China? *NJAS - Wageningen Journal of Life Sciences*, 55 (4), 345-362.
- Feng, S. Z., Krueger, A. B. & Oppenheimer, M. 2010. Linkages among Climate Change, Crop Yields and Mexico-US Cross-Border Migration. *Proceedings of the National Academy of Sciences of the United States of America*, 107 (32), 14257-14262.
- Feng, S. Z., Oppenheimer, M. & Schlenker, W. 2011. *Climate Change, Crop Yields, and Internal Migration in the United States*. Working Paper. National Bureau of Economic Research. Cambridge: Research, N. B. O. E., 43. p.
- Feng, W., Cai, Y. & Gu, B. 2013. Population, Policy, and Politics: How Will History Judge China's One-Child Policy? *Population and Development Review*, 38, 115-129.
- Field, A. P., Miles, J. & Field, Z. 2012. *Discovering Statistics Using R* London: SAGE.
- Field, C. B., Barros, V. R., Stocker, T. F., Qin, D., Dokken, D. J., Ebi, K. L., Mastrandrea, M. D., Mach, K. J., Plattner, G.-K., Allen, S. K., Tignor, M. & Midgley, P. M. (eds.) 2012. *Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation. A Special Report of Working Groups I and II of the Intergovernmental Panel on Climate Change* Cambridge, UK, and New York, NY, USA: Cambridge University Press.
- Filmer, D. & Pritchett, L. H. 2001. Estimating Wealth Effects without Expenditure Data-or Tears: An Application to Educational Enrollments in States of India. *Demography*, 38 (1), 115-132.
- Findlay, A. M. 2011. Migrant Destinations in an Era of Environmental Change. *Global Environmental Change*, 21 (SUPPL. 1), S50-S58.
- Findlay, A. M. 2012. Migration: Flooding and the Scale of Migration. *Nature Clim. Change*, 2 (6), 401-402.
- Findley, S. E. 1994. Does Drought Increase Migration? A Study of Migration from Rural Mali During the 1983-1985 Drought. *International Migration Review*, 28 (3), 539-553.

- Finlayson, B. L., Barnett, J., Wei, T. Y., Webber, M., Li, M. T., Wang, M. Y., Chen, J., Xu, H. & Chen, Z. Y. 2013. The Drivers of Risk to Water Security in Shanghai. *Regional Environmental Change*, 13 (2), 329-340.
- Folke, C. 2006. Resilience: The Emergence of a Perspective for Social–Ecological Systems Analyses. *Global Environmental Change*, 16 (3), 253-267.
- Folke, C., Carpenter, S. R., Walker, B., Scheffer, M., Chapin, T. & Rockström, J. 2010. Resilience Thinking: Integrating Resilience, Adaptability and Transformability. *Ecology and Society*, 15 (4), n/a-n/a.
- Ford, J. D., Keskitalo, E. C. H., Smith, T., Pearce, T., Berrang-Ford, L., Duerden, F. & Smit, B. 2010. Case Study and Analogue Methodologies in Climate Change Vulnerability Research. *Wiley Interdisciplinary Reviews: Climate Change*, 1 (3), 374-392.
- Foresight: Migration and Global Environmental Change 2011. *Migration and Global Environmental Change Future Challenges and Opportunities: Final Project Report*. Final Report. The Government Office for Science. London: The Government Office for Science, 234. p.
- Fraser, E. D. G. 2003. Social Vulnerability and Ecological Fragility: Building Bridges between Social and Natural Sciences Using the Irish Potato Famine as a Case Study. *Ecology and Society*, 7 (2), n/a-n/a.
- Fraser, E. D. G., Mabee, W. & Slaymaker, O. 2003. Mutual Vulnerability, Mutual Dependence - the Reflexive Relation between Human Society and the Environment. *Global Environmental Change-Human and Policy Dimensions*, 13 (2), 137-144.
- Fussell, E., Curtis, K. & DeWaard, J. 2014. Recovery Migration to the City of New Orleans after Hurricane Katrina: A Migration Systems Approach. *Population and Environment*, 35 (3), 305-322.
- Gaetano, A. M. 2004. Filial Daughters, Modern Women: Migrant Domestic Workers in Post-Mao Beijing. In: Gaetano, A. M. & Jacka, T. (eds.) *On the Move : Women and Rural-to-Urban Migration in Contemporary China* New York: Columbia University Press, 41, 79. pp.
- Gaetano, A. M. & Jacka, T. 2004. *On the Move : Women and Rural-to-Urban Migration in Contemporary China* New York: Columbia University Press.
- Gallopin, G. C. 2006. Linkages between Vulnerability, Resilience, and Adaptive Capacity. *Global Environmental Change*, 16 (3), 293-303.
- Garbero, A. & Muttarak, R. 2013. Impacts of the 2010 Droughts and Floods on Community Welfare in Rural Thailand: Differential Effects of Village Educational Attainment. *Ecology and Society*, 18 (4), n/a-n/a.

- Garnaut, R. 2001. Twenty Years of Economic Reform and Structural Change in the Chinese Economy. *In: Garnaut, R. & Huang, Y. (eds.) Growth without Miracles : Readings on the Chinese Economy in the Era of Reform* Oxford: Oxford University Press, 1, 18. pp.
- Garnaut, R. & Huang, Y. 2001. *Growth without Miracles : Readings on the Chinese Economy in the Era of Reform* Oxford: Oxford University Press.
- Geiger, M. & Pécoud, A. 2013. Migration, Development and the 'Migration and Development Nexus'. *Population, Space and Place*, 19 (4), 369-374.
- Gemenne, F. 2011. Why the Numbers Don't Add Up: A Review of Estimates and Predictions of People Displaced by Environmental Changes. *Global Environmental Change*, 21 (Supplementary 1), S41-S49.
- Gemenne, F., Barnett, J., Adger, W. N. & Dabelko, D. G. 2014. Climate and Security: Evidence, Emerging Risks, and a New Agenda. *Climatic Change*, 123 (1), 1-9.
- Gemenne, F., Dun, O., Frühmann, J., Jäger, J., Lu, H. & Stojanov, R. 2008. *Asia Pacific*. General Overview Study. European Union. EACH-FOR, 59. p.
- Gibson, C. C., Ostrom, E. & Ahn, T. K. 2000. The Concept of Scale and the Human Dimensions of Global Change: A Survey. *Ecological Economics*, 32 (2), 217-239.
- Giles, J. & Mu, R. 2007. Elderly Parent Health and the Migration Decisions of Adult Children: Evidence from Rural China. *Demography*, 44 (2), 265-288.
- Glantz, M. H. 1990. Does History Have a Future - Forecasting Climate Change Effects on Fisheries by Analogy. *Fisheries*, 15 (6), 39-44.
- Glantz, M. H. 1991. The Use of Analogies in Forecasting Ecological and Societal Responses to Global Warming. *Environment*, 33 (5), 10-33.
- Glantz, M. H. 1996. Forecasting by Analogy: Local Responses to Global Climate Change. *In: Smith, J. B., Bhatti, N., Menzhulin, G. V., Benioff, R., Campos, M., Jallow, B., Rijsberman, F., Budyko, M. & Dixon, R. K. (eds.) Adapting to Climate Change: An International Perspective* New York: Springer, 407, 426. pp.
- Goffman, E. 1974. *Frame Analysis : An Essay on the Organization of Experience* Cambridge, Mass.: Harvard University Press.
- Gómez, O. 2013. *Climate Change and Migration : A Review of the Literature*. International Institute of Social Studies,,. International Institute of Social Studies, 1, 48. pp.
- Goodess, C. M. 2013. How Is the Frequency, Location and Severity of Extreme Events Likely to Change up to 2060? *Environmental Science & Policy*, 27, Supplement 1 (0), S4-S14.

- Goulden, M. 2006. *Livelihood Diversification, Social Capital and Resilience to Climate Variability Amongst Natural Resource Dependent Societies in Uganda*. PhD Monograph, University of East Anglia.
- Goulden, M., Otto Næss, L., Vincent, K. & Adger, W. N. 2009. Accessing Diversification, Networks and Traditional Resource Management as Adaptations to Climate Extremes. *In: Adger, W. N., Lorenzoni, I. & O'Brien, K. L. (eds.) Adapting to Climate Change ; Thresholds, Values, Governance:* Cambridge University Press, 448, 464. pp.
- Goulden, M. C., Adger, W. N., Allison, E. H. & Conway, D. 2013. Limits to Resilience from Livelihood Diversification and Social Capital in Lake Social–Ecological Systems. *Annals of the Association of American Geographers*, 103 (4), 906-924.
- Gray, C. L. & Moseley, W. G. 2005. A Geographical Perspective on Poverty-Environment Interactions. *Geographical Journal*, 171, 9-23.
- Gray, C. L. & Mueller, V. 2012. Natural Disasters and Population Mobility in Bangladesh. *Proceedings of the National Academy of Sciences*, 109 (16), 6000-6005.
- Gray, D. E. 2014. *Doing Research in the Real World (3rd ed.)*. London: SAGE.
- Greiner, C. & Sakdapolrak, P. 2013. Rural-Urban Migration, Agrarian Change, and the Environment in Kenya: A Critical Review of the Literature. *Population and Environment*, 34 (4), 524-553.
- Gros, S. 2010. A Heuristic Blunder: Notes on an Ethnographic Situation in Southwest China. *Asia Pacific Viewpoint*, 51 (2), 148-163.
- Gu, H., Wang, G., Yu, Z. & Mei, R. 2012. Assessing Future Climate Changes and Extreme Indicators in East and South Asia Using the Regcm4 Regional Climate Model. *Climatic Change*, 114 (2), 301-317.
- Gunderson, L., Kinzig, A., Quinlan, A. & Walker, B. 2010. *Assessing Resilience in Social-Ecological Systems: Workbook for Practitioners. Version 2.0*. Resilience Alliance. Stockholm: Alliance, R., 54.
- Gunderson, L. H., Carpenter, S. R., Folke, C., Olsson, P. & Peterson, G. 2006. Water Rats (Resilience, Adaptability, and Transformability) in Lake and Wetland Social-Ecological Systems. *Ecology and Society*, 11 (1), n/a-n/a.
- Gunderson, L. H. & Holling, C. S. (eds.) 2002. *Panarchy: Understanding Transformations in Human and Natural Systems* Washington, DC: Island Press.
- Guo, M., Chi, I. & Silverstein, M. 2009. Intergenerational Support of Chinese Rural Elders with Migrant Children: Do Sons' or Daughters' Migrations Make a Difference? *Journal of gerontological social work*, 52 (5), 534-54.
- Guo, M., Chi, I. & Silverstein, M. 2011. Family as a Context: The Influence of Family Composition and Family Geographic Dispersion on Intergenerational

- Relationships among Chinese Elderly. *International Journal of Social Welfare*, 20, S18-S29.
- Han, L. 2013. Is Centralized Teacher Deployment More Equitable? Evidence from Rural China. *China Economic Review*, 24 (0), 65-76.
- Hansen, M. H. 2006. In the Footsteps of the Communist Party : Dilemmas and Strategies. In: Heimer, M. & Thøgersen, S. (eds.) *Doing Fieldwork in China* Copenhagen, Denmark: NIAS Press, 81, 95. pp.
- Hao, H., Li, X., Zhang, H. & Zhang, J. 2013. Driving Factors and the Implications of Work Choices of Rural Laborers in Ecologically Vulnerable Areas in North China. *Chinese Journal of Population Resources and Environment*, 11 (4), 357-366.
- Hardee, K., Xie, Z. M. & Gu, B. C. 2004. Family Planning and Women's Lives in Rural China. *International Family Planning Perspectives*, 30 (2), 68-76.
- Hardee-Cleaveland, K. & Banister, J. 1988. Fertility Policy and Implementation in China, 1986-88. *Population & Development Review*, 14 (2), 245-286.
- Hare, D. 1999. 'Push' Versus 'Pull' Factors in Migration Outflows and Returns: Determinants of Migration Status and Spell Duration among China's Rural Population. *The Journal of Development Studies*, 35 (3), 45-72.
- Harvey, D. 1989. *The Condition of Postmodernity : An Enquiry into the Origins of Cultural Change*: Blackwell.
- Hastrup, K. & Olwig, K. F. 2012. *Climate Change and Human Mobility : Global Challenges to the Social Sciences* Cambridge England ; New York: Cambridge University Press.
- He, C. & Ye, J. 2014. Lonely Sunsets: Impacts of Rural–Urban Migration on the Left-Behind Elderly in Rural China. *Population, Space and Place*, 20 (4), 352-369.
- He, S. J., Liu, Y. T., Wu, F. L. & Webster, C. 2010. Social Groups and Housing Differentiation in China's Urban Villages: An Institutional Interpretation. *Housing Studies*, 25 (5), 671-691.
- Heimer, M. & Thøgersen, S. 2006. *Doing Fieldwork in China* Copenhagen: NIAS ; Abingdon : Marston [distributor].
- Helgeson, J. F., Dietz, S. & Hochrainer-Stigler, S. 2013. Vulnerability to Weather Disasters: The Choice of Coping Strategies in Rural Uganda. *Ecology and Society*, 18 (2), n/a-n/a.
- Hellebrandt Da Silva, D. 2010. *Informal Institutions and Adaptive Livelihoods of Fisherfolk in Southern Brazil*. PhD Monograph, University of East Anglia.
- Henry, S., Boyle, P. & Lambin, E. F. 2003. Modelling Inter-Provincial Migration in Burkina Faso, West Africa: The Role of Socio-Demographic and Environmental Factors. *Applied Geography*, 23 (2-3), 115-136.

- Henry, S., Schoumaker, B. & Beauchemin, C. 2004. The Impact of Rainfall on the First out-Migration: A Multi-Level Event-History Analysis in Burkina Faso. *Population and Environment*, 25 (5), 423-460.
- Hoddinott, J. 2006. Shocks and Their Consequences across and within Households in Rural Zimbabwe. *The Journal of Development Studies*, 42 (2), 301-321.
- Hoffman, A. J. 2011. Talking Past Each Other? Cultural Framing of Skeptical and Convinced Logics in the Climate Change Debate. *Organization & Environment*, 24 (1), 3-33.
- Holling, C. S. & Gunderson, L. H. 2002. Resilience and Adaptive Cycles. In: Gunderson, L. H. & Holling, C. S. (eds.) *Panarchy : Understanding Transformations in Human and Natural Systems* Washington, D.C. ; London: Island Press, 25, 62. pp.
- Holling, C. S., Gunderson, L. H. & Peterson, G. D. 2002. Sustainability and Panarchies. In: Holling, C. S. & Gunderson, L. H. (eds.) *Panarchy: Understanding Transformations in Human and Natural Systems* Washington, DC: Island Press, 63, 102. pp.
- Homer-Dixon, T. F. 1999. *Environment, Scarcity, and Violence* Princeton, N.J.: Princeton University Press.
- Huang, D., Zhang, R., Huo, Z., Mao, F., E, Y. & Zheng, W. 2012. An Assessment of Multidimensional Flood Vulnerability at the Provincial Scale in China Based on the Dea Method. *Natural Hazards*, 64 (2), 1575-1586.
- Hugo, G. 1998. Migration as a Survival Strategy: The Family Dimension of Migration. In: United Nations Department of Economic and Social Affairs Population Division, ed. *Proceedings of the United Nations Expert Group Meeting on Population Distribution and Migration*, Santa Cruz, Bolivia, 1998. United Nations : New York, New York.
- Hugo, G. 2008. *Migration, Development and Environment* Geneva: International Organization for Migration.
- Hugo, G. 2011. Future Demographic Change and Its Interactions with Migration and Climate Change. *Global Environmental Change-Human and Policy Dimensions*, 21, S21-S33.
- Hugo, G. 2012. Climate Change-Induced Mobility and the Existing Migration Regime in Asia and the Pacific. In: Mcadam, J. (ed.) *Climate Change and Displacement : Multidisciplinary Perspectives* Oxford: Hart, 9, 36. pp.
- Hulme, M. 2009. *Why We Disagree About Climate Change: Understanding Controversy, Inaction and Opportunity* Cambridge, UK ; New York: Cambridge University Press.

- Hummel, D., Adamo, S., Sherbinin, A., Murphy, L., Aggarwal, R., Zulu, L., Liu, J. & Knight, K. 2013. Inter- and Transdisciplinary Approaches to Population-Environment Research for Sustainability Aims: A Review and Appraisal. *Population and Environment*, 34 (4), 481-509.
- Hummel, D., Lux, A., de Sherbinin, A. & Adamo, S. B. 2009. Theoretical and Methodological Issues in the Analysis of Population Dynamics and Supply Systems. In: Theoretical and Methodological Issues of the Analysis of Population Dynamics and the Environment, Virtual, January 2009. Population and Environment Research Network.
- Hunter, L. M. 2005. Migration and Environmental Hazards. *Population and Environment*, 26 (4), 273-302.
- Hunter, L. M. & David, E. 2011. Displacement, Climate Change and Gender. In: Piguët, É., Pécouët, A. & Guchteneire, P. F. a. D. (eds.) *Migration and Climate Change* Cambridge: Cambridge University Press, 306, 330. pp.
- Hunter, L. M., Nawrotzki, R., Leyk, S., Maclaurin, G. J., Twine, W., Collinson, M. & Erasmus, B. 2014. Rural Outmigration, Natural Capital, and Livelihoods in South Africa. *Population, Space and Place*, 20 (5), 402-420.
- Hvistendahl, M. 2013. Foreigners Run Afoul of China's Tightening Secrecy Rules. *Science*, 339 (6118), 384-385.
- International Federation of Red Cross and Red Crescent Societies 2011. *China: Floods*. International Federation of Red Cross and Red Crescent Societies, 5. p.
- Jacka, T. 2005. Finding a Place. *Critical Asian Studies*, 37 (1), 51-74.
- Jacka, T. & Gaetano, A. M. 2004. Focusing on Migrant Women. In: Gaetano, A. M. & Jacka, T. (eds.) *On the Move : Women and Rural-to-Urban Migration in Contemporary China* New York: Columbia University Press,, 1, 38. pp.
- Jackson, C. 1998. Gender, Irrigation, and Environment: Arguing for Agency. *Agriculture and Human Values*, 15 (4), 313-324.
- Jackson, C. 1999. Social Exclusion and Gender: Does One Size Fit All? *The European Journal of Development Research*, 11 (1), 125-146.
- Jacobson, J. L. 1988. Environmental Refugees: A Yardstick of Habitability. *Bulletin of Science, Technology and Society*, 8 (3), 257-258.
- Jakobsen, T. S. 2014. Chinese Peasants in Transition. In: Lund, R., Kusakabe, K., Mishra Panda, S. & Wang, Y. (eds.) *Gender, Mobilities, and Livelihood Transformations : Comparing Indigenous People in China, India, and Laos* Abingdon, Oxon ; New York: Routledge, 69, 92. pp.
- Jónsson, G. 2010. *The Environmental Factor in Migration Dynamics – a Review of African Case Studies*. Working Paper. International Migration Institute, James Martin 21st Century School, university of Oxford. Oxford, 34. p.

- Jun, H., Chuanyi, C. & Aiai, F. 2009. Rural Labor-Force Allocation Report—an Investigation of 2,749 Villages. *In: Cai, F. & Du, Y. (eds.) The China Population and Labor Yearbook Volume 1: Leiden: Brill, 137, 152. pp.*
- Kates, R. W., Travis, W. R. & Wilbanks, T. J. 2012. Transformational Adaptation When Incremental Adaptations to Climate Change Are Insufficient. *Proceedings of the National Academy of Sciences, 109 (19), 7156-7161.*
- Keck, M. & Sakdapolrak, P. 2013. What Is Social Resilience? Lessons Learned and Ways Forward. *Erdkunde, 67 (1), 5-19.*
- Kelliher, D. R. 1992. *Peasant Power in China : The Era of Rural Reform, 1979-1989* New Haven: Yale University Press.
- King, R. 2011. Geography and Migration Studies: Retrospect and Prospect. *Population Space and Place, 18 (2), 134-153.*
- Kniveton, D., Schmidt-Verkerk, K., Smith, C. & Black, R. 2008. *Climate Change and Migration: Improving Methodologies to Estimate Flows*. Research series. International Organization for Migration,,. Genva: Migration, I. O. F., 1, 68 p.
- Kniveton, D., Smith, C., Black, R. & Schmidt-Verkerk, K. 2009. Challenges and Approaches to Measuring the Migration– Environment Nexus. *In: Laczko, F. & Aghazarm, C. (eds.) Migration, Environment and Climate Change: Assessing the Evidence: Intl Organization for Migration, 41, 112. pp.*
- Kniveton, D. R., Smith, C. D. & Black, R. 2012. Emerging Migration Flows in a Changing Climate in Dryland Africa. *Nature Clim. Change*, advance online publication.
- Kumar, S. 2002. *Methods for Community Participation : A Complete Guide for Practitioners* London: ITDG.
- Laczko, F. & Aghazarm, C. (eds.) 2009. *Migration, Environment and Climate Change: Assessing the Evidence: Intl Organization for Migration.*
- Langridge, R., Christian-Smith, J. & Lohse, K. A. 2006. Access and Resilience: Analyzing the Construction of Social Resilience to the Threat of Water Scarcity. *Ecology and Society, 11 (2), n/a-n/a.*
- Leach, M. Year. Re-Framing Resilience: A Symposium Report. *In: Re-framing Resilience Symposium, 2008 2008 Brighton. Institute of Development Studies, 18. p.*
- Leach, M., Mearns, R. & Scoones, I. 1999. Environmental Entitlements: Dynamics and Institutions in Community-Based Natural Resource Management. *World Development, 27 (2), 225-247.*
- Leach, M., Scoones, I. & Stirling, A. 2010. *Dynamic Sustainabilities : Technology, Environment, Social Justice* London: London : Earthscan.

- Leach, M. e. 2008. *Re-Framing Resilience: A Symposium Report* STEPS Centre. Brighton, 18.
- Lefebvre, H. 1991. *The Production of Space* Oxford: Wiley- Blackwell.
- Li, C., Li, S., Feldman, M. W., Daily, G. C. & Li, J. 2012. Does out-Migration Reshape Rural Households' Livelihood Capitals in the Source Communities? Recent Evidence from Western China. *Asian and Pacific Migration Journal*, 21 (1), 1-30.
- Li, L. 2013. The Path to Made-in-China: How This Was Done and Future Prospects. *International Journal of Production Economics*, 146 (1), 4-13.
- Li, L. & Tonts, M. 2014. The Impacts of Temporary Labour Migration on Farming Systems of the Loess Plateau, Gansu Province, China. *Population, Space and Place*, 20 (4), 316-332.
- Li, Y., Conway, D., Wu, Y., Gao, Q., Rothausen, S., Xiong, W., Ju, H. & Lin, E. 2013. Rural Livelihoods and Climate Variability in Ningxia, Northwest China. *Climatic Change*, 119 (3-4), 891-904.
- Li, Y., Conway, D., Xiong, W., Gao, Q., Wu, Y., Wan, Y. & Zhang, S. 2011. Effects of Climate Variability and Change on Chinese Agriculture: A Review. *Climate Research*, 50 (1), 83-102.
- Li, Y., Liu, Y., Long, H. & Cui, W. 2014. Community-Based Rural Residential Land Consolidation and Allocation Can Help to Revitalize Hollowed Villages in Traditional Agricultural Areas of China: Evidence from Dancheng County, Henan Province. *Land Use Policy*, 39 (0), 188-198.
- Li, Y. P., Ye, W., Wang, M. & Yan, X. D. 2009. Climate Change and Drought: A Risk Assessment of Crop-Yield Impacts. *Climate Research*, 39 (1), 31-46.
- Liang, Z. & Chen, Y. P. 2007. The Educational Consequences of Migration for Children in China. *Social Science Research*, 36 (1), 28-47.
- Liang, Z. & Ma, Z. 2004. China's Floating Population: New Evidence from the 2000 Census. *Population and Development Review*, 30 (3), 467-488.
- Lin, J. Y. F. 1992. Rural Reforms and Agricultural Growth in China. *American Economic Review*, 82 (1), 34-51.
- Liu, G., Chen, Y. & He, H. 2012. China's Environmental Challenges Going Rural and West. *Environment and Planning A*, 44 (7), 1657-1660.
- Liu, J. 2014. Ageing, Migration and Familial Support in Rural China. *Geoforum*, 51 (0), 305-312.
- Locke, C., Seeley, J. & Rao, N. 2013. Migration, Reconfigurations of Family Relations and Social (in)Security: An Introduction. *Third World Quarterly*, 34 (10), 1872-1880.
- Logan, J. R. 2008. *Urban China in Transition* Malden, MA ; Oxford: Blackwell Pub. Ltd.

- Long, H. 2014. Land Consolidation: An Indispensable Way of Spatial Restructuring in Rural China. *Journal of Geographical Sciences*, 24 (2), 211-225.
- Long, H., Li, Y., Liu, Y., Woods, M. & Zou, J. 2012. Accelerated Restructuring in Rural China Fueled by 'Increasing Vs. Decreasing Balance' Land-Use Policy for Dealing with Hollowed Villages. *Land Use Policy*, 29 (1), 11-22.
- Long, H., Liu, Y., Li, X. & Chen, Y. 2010. Building New Countryside in China: A Geographical Perspective. *Land Use Policy*, 27 (2), 457-470.
- Luo, B. & Zhan, H. 2012. Filial Piety and Functional Support: Understanding Intergenerational Solidarity among Families with Migrated Children in Rural China. *Ageing International*, 37 (1), 69-92.
- Lutz, H. 2010. Gender in the Migratory Process. *Journal of Ethnic and Migration Studies*, 36 (10), 1647-1663.
- Marshall, N. A. & Marshall, P. A. 2007. Conceptualizing and Operationalizing Social Resilience within Commercial Fisheries in Northern Australia. *Ecology and Society*, 12 (1), n/a-n/a.
- Martin-Breen, P. & Anderies, J. M. 2011. *Resilience: A Literature Review*. City University of New York. New York, 64. p.
- Mason, J. 2002. *Qualitative Researching (2nd)*. London ; Thousand Oaks, Calif.: Sage Publications.
- Massey, D. S., Alarcón, R., Durand, J. & González, H. 1987. *Return to Aztlan : The Social Process of International Migration from Western Mexico* Berkeley ; London: University of California Press.
- Massey, D. S., Arango, J., Hugo, G. J., Kouaouci, A., Pellegrino, A. & Taylor, J. E. 1998. *Worlds in Motion: Understanding International Migration at the End of the Millenium* Oxford; New York: Clarendon Press; Oxford University Press.
- Mauro, S. E.-D. 2009. Seeing the Local in the Global: Political Ecologies, World-Systems, and the Question of Scale. *Geoforum*, 40 (1), 116-125.
- McLaughlin, P. & Dietz, T. 2008. Structure, Agency and Environment: Toward an Integrated Perspective on Vulnerability. *Global Environmental Change-Human and Policy Dimensions*, 18 (1), 99-111.
- McLeman, R. 2010. Impacts of Population Change on Vulnerability and the Capacity to Adapt to Climate Change and Variability: A Typology Based on Lessons from "a Hard Country". *Population and Environment*, 31 (5), 286-316.
- McLeman, R. 2013. Developments in Modelling of Climate Change-Related Migration. *Climatic Change*, 117 (3), 599-611.
- McLeman, R. & Hunter, L. M. 2010. Migration in the Context of Vulnerability and Adaptation to Climate Change: Insights from Analogues. *Wiley Interdisciplinary Reviews: Climate Change*, 1 (3), 450-461.

- McLeman, R. & Smit, B. 2006. Migration as an Adaptation to Climate Change. *Climatic Change*, 76 (1-2), 31-53.
- Mearns, R. 1995. Institutions and Natural Resource Management: Access to and Control over Woodfuel in East Africa. In: Binns, T. (ed.) *People and Environment in Africa* New York ; Chichester: Wiley, 103, 114. pp.
- Michaud, J. 2010. Research Note: Fieldwork, Supervision and Trust. *Asia Pacific Viewpoint*, 51 (2), 220-225.
- Millennium Ecosystem Assessment 2005. *Ecosystems and Human Well-Being: Synthesis*. World Resources Institute. Washington, DC.: Press, I., 1-137.
- Miller, F., Osbahr, H., Boyd, E., Thomalla, F., Bharwani, S., Ziervogel, G., Walker, B., Birkmann, J., van der Leeuw, S., Rockström, J., Hinkel, J., Downing, T., Folke, C. & Nelson, D. 2010. Resilience and Vulnerability: Complementary or Conflicting Concepts? *Ecology and Society*, 15 (3), n/a-n/a.
- Miller, T. 2012. *China's Urban Billion : The Story Behind the Biggest Migration in Human History* London ; New York: Zed Books ; Distributed in the USA exclusively by Palgrave Macmillan.
- Milly, P. C. D., Betancourt, J., Falkenmark, M., Hirsch, R. M., Kundzewicz, Z. W., Lettenmaier, D. P. & Stouffer, R. J. 2008. Climate Change: Stationarity Is Dead: Whither Water Management? *Science*, 319 (5863), 573-574.
- Morrissey, J. W. 2009. *Environmental Change and Forced Migration: A State of the Art Review*. University of Oxford. Oxford, 49. p.
- Morrissey, J. W. 2013. Understanding the Relationship between Environmental Change and Migration: The Development of an Effects Framework Based on the Case of Northern Ethiopia. *Global Environmental Change*, 23 (6), 1501-1510.
- Morse, W. C., McLaughlin, W. J., Wulfhorst, J. D. & Harvey, C. 2013. Social Ecological Complex Adaptive Systems: A Framework for Research on Payments for Ecosystem Services. *Urban Ecosystems*, 16 (1), 53-77.
- Mortimore, M. J. & Adams, W. M. 2001. Farmer Adaptation, Change and 'Crisis' in the Sahel. *Global Environmental Change*, 11 (1), 49-57.
- Morton, J. F. 2007. The Impact of Climate Change on Smallholder and Subsistence Agriculture. *Proceedings of the National Academy of Sciences of the United States of America*, 104 (50), 19680-19685.
- Mullan, K., Grosjean, P. & Kontoleon, A. 2011. Land Tenure Arrangements and Rural-Urban Migration in China. *World Development*, 39 (1), 123-133.
- Müller, C., Bondeau, A., Popp, A., Waha, K. & Fader, M. 2010. *Climate Change Impacts on Agricultural Yields*. Background Note. Potsdam Institute for Climate Impact Research (PIK). Potsdam, Germany, 11.

- Murphy, R. 2002. *How Migrant Labor Is Changing Rural China* Cambridge, UK ; New York: Cambridge University Press.
- Murphy, R. 2004. The Impact of Labor Migration on the Well-Being and Agency of Rural Chinese Women : Cultural and Economic Contexts and the Life Course. *In: Gaetano, A. M. & Jacka, T. (eds.) On the Move : Women and Rural-to-Urban Migration in Contemporary China* New York: Columbia University Press,, 243, 276. pp.
- Myers, N. 1993. Environmental Refugees in a Globally Warmed World. *Bioscience*, 43 (11), 752-761.
- Myers, N. 2002. Environmental Refugees: A Growing Phenomenon of the 21st Century. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 357 (1420), 609-613.
- Myers, N. & Kent, J. 1995. *Environmental Exodus : An Emergent Crisis in the Global Arena* Washington, D.C.: Climate Institute.
- National Development and Reform Commission 2007. *China's National Climate Change Programme*. People's Republic China, 62. p.
- Nelson, D. R., Adger, W. N. & Brown, K. 2007. Adaptation to Environmental Change: Contributions of a Resilience Framework. *Annual Review of Environment and Resources*, 39, 419. pp.
- Neumann, R. P. 2009. Political Ecology: Theorizing Scale. *Progress in Human Geography*, 33 (3), 398-406.
- Nguyen, K. V. & James, H. 2013. Measuring Household Resilience to Floods: A Case Study in the Vietnamese Mekong River Delta. *Ecology and Society*, 18 (3), n/a-n/a.
- Nguyen, M. T. N. & Locke, C. 2014. Rural-Urban Migration in Vietnam and China: Gendered Householding, Production of Space and the State. *The Journal of Peasant Studies*, 41 (5), 855-876.
- Norse, D., Lu, Y. & Huajun, T. 2010. *Foresight: The Future of Food and Farming: Foresight Report's Implications for China*. Implications report. The Government Office for Science. London: The Government Office for Science, 53.
- North, D. C. 1990. *Institutions, Institutional Change and Economic Performance* Cambridge: Cambridge University Press.
- Nuijten, E. 2011. Combining Research Styles of the Natural and Social Sciences in Agricultural Research. *Njas-Wageningen Journal of Life Sciences*, 57 (3-4), 197-205.
- Obokata, R., Veronis, L. & McLeman, R. 2014. Empirical Research on International Environmental Migration: A Systematic Review. *Population and Environment*, 36 (1), 111-135.

- Oliver-Smith, A. 2009. *Nature, Society, and Population Displacement: Toward an Understanding of Environmental Migration and Social Vulnerability*. United Nations University. Bonn: United Nations University, 36. p.
- Organisation for Economic Cooperation and Development 2009. *Rural Policy Reviews: China*. Policy Brief. Organisation for Economic Cooperation and Development. Paris: Organisation for Economic Cooperation and Development, 1-8.
- Osbahr, H., Twyman, C., Adger, W. N. & Thomas, D. S. G. 2008. Effective Livelihood Adaptation to Climate Change Disturbance: Scale Dimensions of Practice in Mozambique. *Geoforum*, 39 (6), 1951-1964.
- Paavola, J. 2008. Livelihoods, Vulnerability and Adaptation to Climate Change in Morogoro, Tanzania. *Environmental Science & Policy*, 11 (7), 642-654.
- Pandey, S., Bhandari, H., Ding, S., Prapertchob, P., Sharan, R., Naik, D., Taunk, S. K. & Sastri, A. 2007. Coping with Drought in Rice Farming in Asia: Insights from a Cross-Country Comparative Study. *Agricultural Economics*, 37, 213-224.
- Patt, A., Klein, R. J. T. & de la Vega-Leinert, A. 2005. Taking the Uncertainty in Climate-Change Vulnerability Assessment Seriously. *Comptes Rendus Geoscience*, 337 (4), 411-424.
- Pelling, M. 2011. *Adaptation to Climate Change : From Resilience to Transformation* London ; New York: Routledge.
- Peng, X. 1991. *Demographic Transition in China : Fertility Trends since the 1950s*: Oxford : Clarendon.
- Peng, X. 2011. China's Demographic History and Future Challenges. *Science*, 333 (6042), 581-587.
- Perch-Nielsen, S., Battig, M. & Imboden, D. 2008. Exploring the Link between Climate Change and Migration. *Climatic Change*, 91 (3-4), 375-393.
- Peterson, G. 2000. Political Ecology and Ecological Resilience : An Integration of Human and Ecological Dynamics. *Ecological Economics*, 35 (3), 323-336.
- Piao, S. L., Ciais, P., Huang, Y., Shen, Z. H., Peng, S. S., Li, J. S., Zhou, L. P., Liu, H. Y., Ma, Y. C., Ding, Y. H., Friedlingstein, P., Liu, C. Z., Tan, K., Yu, Y. Q., Zhang, T. Y. & Fang, J. Y. 2010. The Impacts of Climate Change on Water Resources and Agriculture in China. *Nature*, 467 (7311), 43-51.
- Piguet, É. 2010. Linking Climate Change, Environmental Degradation, and Migration: A Methodological Overview. *Wiley Interdisciplinary Reviews: Climate Change*, 1 (4), 517-524.
- Piguet, É., Pécoud, A. & Guchteneire, P. F. A. d. 2011. Introduction: Migration and Climate Change. In: Piguet, É., Pécoud, A. & Guchteneire, P. F. a. D. (eds.) *Migration and Climate Change* Cambridge: Cambridge University Press, 1, 33. pp.

- Piore, M. J. 1979. *Birds of Passage : Migrant Labor and Industrial Societies* Cambridge ; New York: Cambridge University Press.
- Polsky, C. & Easterling III, W. E. 2001. Adaptation to Climate Variability and Change in the Us Great Plains: A Multi-Scale Analysis of Ricardian Climate Sensitivities. *Agriculture Ecosystems & Environment*, 85 (1-3), 133-144.
- Poston, D. L., Jr. & Zhang, L. 2008. Ecological Analyses of Permanent and Temporary Migration Streams in China in the 1990s. *Population Research and Policy Review*, 27 (6), 689-712.
- Pouliotte, J., Smit, B. & Westerhoff, L. 2009. Adaptation and Development: Livelihoods and Climate Change in Subarnabad, Bangladesh. *Climate and Development*, 1 (1), 31-46.
- Putterman, L. 1993. *Continuity and Change in China's Rural Development : Collective and Reform Eras in Perspective* New York ; Oxford: Oxford University Press.
- Qi, X. 2014. Filial Obligation in Contemporary China: Evolution of the Culture-System. *Journal for the Theory of Social Behaviour*, 10.1111/jtsb.12052.
- Qian, W., Yu, Z. & Zhu, Y. 2006. Spatial and Temporal Variability of Precipitation in East China from 1880 to 1999. *Climate Research*, 32 (3), 209-218.
- Qin, H. 2010. Rural-to-Urban Labor Migration, Household Livelihoods, and the Rural Environment in Chongqing Municipality, Southwest China. *Human Ecology*, 38 (5), 675-690.
- Quan, R. S. 2014. Rainstorm Waterlogging Risk Assessment in Central Urban Area of Shanghai Based on Multiple Scenario Simulation. *Natural Hazards*, 73 (3), 1569-1585.
- Rademacher-Schulz, C., Afifi, T., Warner, K., Rosenfeld, T., Milan, A., Etzold, B. & Sakdapolrak, P. 2012. *Rainfall Variability, Food Security and Human Mobility. An Approach for Generating Empirical Evidence*. United Nations University - Institute for Environment and Human Security. Bonn: United Nations University, 106. p.
- Ravenstein, E. G. 1889. The Laws of Migration. *Journal of the Royal Statistical Society*, 52 (2), 241-305.
- Renaud, F. G., Bogardi, J. J., Dun, O. & Warner, K. 2007. *Control, Adapt or Flee: How to Face Environmental Migration?* United Nations University Institute for Environment and Human Security. Bonn: United Nations University, 48. p.
- Renaud, F. G., Dun, O., Warner, K. & Bogardi, J. 2011. A Decision Framework for Environmentally Induced Migration. *International Migration*, 49, e5-e29.
- Resilience Alliance 2010. *Assessing Resilience in Social-Ecological Systems: Workbook for Practitioners. Version 2.0*. Resilience Alliance. Stockholm: Resilience Alliance, 54. p.

- Resilience Alliance. 2014a. *Glossary* [Online]. Stockholm: Resilience Alliance.
Available: <http://www.resalliance.org/index.php/glossary> [Accessed 19/11/2014].
- Resilience Alliance. 2014b. *Key Concepts* [Online]. Stockholm: Resilience Alliance.
Available: http://www.resalliance.org/index.php/key_concepts [Accessed 19/11/2014].
- Ribot, J. 2014. Cause and Response: Vulnerability and Climate in the Anthropocene. *The Journal of Peasant Studies*, 41 (5), 667-705.
- Richter, C. 2013. Migration as a Development Enabler: Putting Enablers into Practice in the Post-2015 Development Agenda. *Migration Policy Practice* [Online], 3.
- Rigg, J. 2012. *Unplanned Development : Tracking Change in South-East Asia* London: Zed.
- Robbins, P. 2004. *Political Ecology : A Critical Introduction* Malden, MA ; Oxford: Blackwell Pub.
- Roberts, K., Connelly, R., Xie, Z. M. & Zheng, Z. Z. 2004. Patterns of Temporary Labor Migration of Rural Women from Anhui and Sichuan. *China Journal*, 52, 49-70.
- Robson, C. 2002. *Real World Research : A Resource for Social Scientists and Practitioner-Researchers (2nd ed.)*. Malden, Mass. ; Oxford: Blackwell Publishers.
- Rockström, J. & Leach, M. 2014. *Plenary Session 2: Which Development Pathways within Planetary Boundaries* [Online]. Resilience 2014: Resilience Alliance.
Available: <http://www.resilience2014.org/outputs-outcomes/videos-session2> [Accessed 21/11/2014].
- Rosenzweig, C., Elliott, J., Deryng, D., Ruane, A. C., Mueller, C., Arneth, A., Boote, K. J., Folberth, C., Glotter, M., Khabarov, N., Neumann, K., Piontek, F., Pugh, T. A. M., Schmid, E., Stehfest, E., Yang, H. & Jones, J. W. 2014. Assessing Agricultural Risks of Climate Change in the 21st Century in a Global Gridded Crop Model Intercomparison. *Proceedings of the National Academy of Sciences of the United States of America*, 111 (9), 3268-3273.
- Rozelle, S., Taylor, J. E. & deBrauw, A. 1999. Migration, Remittances, and Agricultural Productivity in China. *American Economic Review*, 89 (2), 287-291.
- Sabates-Wheeler, R., Devereux, S., Mitchell, T., Tanner, T., Davies, M. & Leavy, J. 2008. *Rural Disaster Risk –Poverty Interface*. Institute of Development Studies. 1 - 54 pp.
- Sakdapolrak, P., Promburom, P. & Reif, A. 2013. Why Successful in Situ Adaptation with Environmental Stress Does Not Prevent People from Migrating? Empirical Evidence from Northern Thailand. *Climate and Development*, 10.1080/17565529.2013.826129.
- Samers, M. 2010. *Migration*: London : Routledge.

- Samir, K. C. 2013. Community Vulnerability to Floods and Landslides in Nepal. *Ecology and Society*, 18 (1).
- Sargeson, S. 2002. Subduing "the Rural House-Building Craze": Attitudes Towards Housing Construction and Land Use Controls in Four Zhejiang Villages. *The China Quarterly*, 172, 927-955.
- Sayre, N. F. 2005. Ecological and Geographical Scale: Parallels and Potential for Integration. *Progress in Human Geography*, 29 (3), 276-290.
- Schipper, L. & Burton, I. 2009a. *The Earthscan Reader on Adaptation to Climate Change* London: Earthscan.
- Schipper, L. & Burton, I. 2009b. Understanding Adaptation: Origins, Concepts Practice and Policy. In: Schipper, L. & Burton, I. (eds.) *The Earthscan Reader on Adaptation to Climate Change* London: Earthscan, 1, 8. pp.
- Schön, D. A. & Rein, M. 1994. *Frame Reflection : Toward the Resolution of Intractable Policy Controversies* New York: BasicBooks.
- Scoones, I. 1998. *Sustainable Rural Livelihoods: A Framework for Analysis*. Working Paper Series. Institute of Development Studies. Sussex.
- Scoones, I. 2009. Livelihoods Perspectives and Rural Development. *The Journal of Peasant Studies*, 36 (1), 171-196.
- Sen, A. 1981. *Poverty and Famines : An Essay on Entitlement and Deprivation (Repr. with corrections.)*. Oxford: Clarendon, 1982.
- Sen, A. 1984. *Resources, Values and Development* Oxford: Blackwell.
- Sen, A. 1990. Gender and Cooperative Conflicts. In: Irene, T. (ed.) *Persistent Inequalities* New York: Oxford University Press, 123, 149. pp.
- Sen, A. 1999. *Development as Freedom* Oxford: Oxford University Press.
- Shaw, D., Scully, J. & Hart, T. 2014. The Paradox of Social Resilience: How Cognitive Strategies and Coping Mechanisms Attenuate and Accentuate Resilience. *Global Environmental Change*, 10.1016/j.gloenvcha.2014.01.006 (0).
- Sheller, M. & Urry, J. 2006. The New Mobilities Paradigm. *Environment and Planning A*, 38 (2), 207-226.
- Shrestha, N. R. 1988. A Structural Perspective on Labor Migration in Underdeveloped-Countries. *Progress in Human Geography*, 12 (2), 179-207.
- Shuai, J., Zhang, Z., Sun, D.-Z., Tao, F. & Shi, P. 2013. Enso, Climate Variability and Crop Yields in China. *Climate Research*, 58 (2), 133-148.
- Sikor, T. & Nguyen, T. Q. 2007. Why May Forest Devolution Not Benefit the Rural Poor? Forest Entitlements in Vietnam's Central Highlands. *World Development*, 35 (11), 2010-2025.
- Silverstein, M., Cong, Z. & Li, S. Z. 2006. Intergenerational Transfers and Living Arrangements of Older People in Rural China: Consequences for Psychological

- Well-Being. *Journals of Gerontology Series B-Psychological Sciences and Social Sciences*, 61 (5), S256-S266.
- Simelton, E. 2011. Food Self-Sufficiency and Natural Hazards in China. *Food Security*, 3 (1), 35-52.
- Singer, A. & Massey, D. S. 1998. The Social Process of Undocumented Border Crossing among Mexican Migrants. *International Migration Review*, 32 (3), 561-592.
- Skoufias, E. 2003. Economic Crises and Natural Disasters: Coping Strategies and Policy Implications. *World Development*, 31 (7), 1087-1102.
- Slingo, J. M., Challinor, A. J., Hoskins, B. J. & Wheeler, T. R. 2005. Introduction: Food Crops in a Changing Climate. *Philosophical Transactions of the Royal Society B-Biological Sciences*, 360 (1463), 1983-1989.
- Smit, B. & Wandel, J. 2006. Adaptation, Adaptive Capacity and Vulnerability. *Global Environmental Change*, 16 (3), 282-292.
- Solomon, S., Qin, D., Manning, M., Alley, R. B., Berntsen, T., Bindoff, N. L., Chen, Z., Chidthaisong, A., Gregory, J. M., Hegerl, G. C., Heimann, M., Hewitson, B., Hoskins, B. J., Joos, F., Jouzel, J., Kattsov, V., Lohmann, U., Matsuno, T., Molina, M., Nicholls, N., Overpeck, J., Raga, G., Ramaswamy, V., Ren, J., Rusticucci, M., Somerville, R., Stocker, T. F., Whetton, P., R.A., W. & Wratt, D. 2007. Technical Summary. In: Solomon, S., Qin, D., Manning, M., Chen, Z., Marquis, M., Averyt, K. B., Tignor, M. & Miller, H. L. (eds.) *Climate Change 2007 : The Physical Science Basis : Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* Cambridge: Cambridge University Press, 20, 91. pp.
- Song, C. H., Lord, J. W., Zhou, L. M. & Xiao, J. F. 2008. Empirical Evidence for Impacts of Internal Migration on Vegetation Dynamics in China from 1982 to 2000. *Sensors*, 8 (8), 5069-5080.
- Song, Y., Qi, G., Zhang, Y. & Vernooy, R. 2013. Farmer Cooperatives in China: Diverse Pathways to Sustainable Rural Development. *International Journal of Agricultural Sustainability*, 10.1080/14735903.2013.858443.
- Speare, A., Frey, W. H. & Goldstein, S. 1974. *Residential Mobility, Migration, and Metropolitan Change*. [by] Alden Speare, Sidney Goldstein, William H. Frey: Cambridge, Mass.: Ballinger Publishing Co.
- Stark, O. & Bloom, D. E. 1985. The New Economics of Labor Migration. *American Economic Review*, 75 (2), 173-178.
- Stark, O. & Levhari, D. 1982. On Migration and Risk in Ldcs. *Economic Development and Cultural Change*, 31 (1), 191-196.

- Stark, O. & Lucas, R. E. B. 1988. Migration, Remittances, and the Family. *Economic Development and Cultural Change*, 36 (3), 465-481.
- Stern, N. H. 2007. *The Economics of Climate Change : The Stern Review* Cambridge: Cambridge : Cambridge University Press.
- Suhrke, A. 1993. Pressure Points : Environmental Degradation, Migration and Conflict. In: "Environmental Change, Population Displacement, and Acute Conflict, Ottawa, June 1993. University of Toronto : Cambridge American Academy of Arts and Sciences ; Cambridge, Massachusetts.
- Sun, M. & Fan, C. C. 2010. China's Permanent and Temporary Migrants: Differentials and Changes, 1990 - 2000. *The Professional Geographer*, 63 (1), 92-112.
- Sun, X., Warner, T. J., Yang, D. L. & Liu, M. 2013. Patterns of Authority and Governance in Rural China: Who's in Charge? Why? *Journal of Contemporary China*, 10.1080/10670564.2013.782124.
- Sutherland, P. D. 2013. Migration Is Development: How Migration Matters to the Post-2015 Debate. *Migration and Development*, 10.1080/21632324.2013.817763, 1-6.
- Tacoli, C. 2009. Crisis or Adaptation? Migration and Climate Change in a Context of High Mobility. *Environment and Urbanization*, 21 (2), 513-525.
- Talwar, J. P. 2012. Immigrants and 'American' Franchises Experiences from the Field. In: Vargas-Silva, C. (ed.) *Handbook of Research Methods in Migration*: Cheltenham, UK ; Northampton, MA : Edward Elgar, 2012., 523, 544. pp.
- Tan, Y. 2011. Chinese Perspectives on Climate Change and Resttlement In: Preparing for Population Displacement and Resettlement Associated with Climate Change and Large Climate Mitigation and Adaptation Projects, Virtual, November 2011. Population and Environment Research Network.
- Tan, Y. & Guo, F. 2007. Environmental Concerns and Population Displacement in West China. In: APMRN Conference, Fuzhou, 2007 2007.
- Tan, Y., Zuo, A. & Hugo, G. 2013. Environment-Related Resettlement in China: A Case Study of the Ganzi Tibetan Autonomous Prefecture in Sichuan Province. *Asian and Pacific Migration Journal*, 22 (1), 77-107.
- Tanner, T. & Horn-Phathanothai, L. 2014. Climate Change and Development. Hoboken: Taylor and Francis.
- Tanner, T., Lewis, D., Wrathall, D., Bronen, R., Cradock-Henry, N., Huq, S., Lawless, C., Nawrotzki, R., Prasad, V., Rahman, M. A., Alaniz, R., King, K., McNamara, K., Nadiruzzaman, M., Henly-Shepard, S. & Thomalla, F. 2015. Livelihood Resilience in the Face of Climate Change. *Nature Clim. Change*, 5 (1), 23-26.

- Tao, F., Yokozawa, M., Liu, J. & Zhang, Z. 2009. Climate Change, Land Use Change, and China's Food Security in the Twenty-First Century: An Integrated Perspective. *Climatic Change*, 93 (3-4), 433-445.
- Tao, F. L., Yokozawa, M., Zhang, Z., Hayashi, Y., Grassl, H. & Fu, C. B. 2004. Variability in Climatology and Agricultural Production in China in Association with the East Asian Summer Monsoon and El Nino Southern Oscillation. *Climate Research*, 28 (1), 23-30.
- Taylor, G. 2011. *China's Floating Migrants: Updates from the 2005 1% Population Sample Survey*. Working Paper. London School of Economics and Political Science. London: London School of Economics and Political Science, 45.
- Taylor, J. E., Rozelle, S. & de Brauw, A. 2003. Migration and Incomes in Source Communities: A New Economics of Migration Perspective from China. *Economic Development and Cultural Change*, 52 (1), 75-101.
- Taylor, M. 2015. *The Political Ecology of Climate Change Adaptation : Livelihoods, Agrarian Change and the Conflicts of Development* London ; New York: Routledge.
- Tebboth, M. 2014. *Less Discussed Aspects of Doing Phd Research: An Interdisciplinary, Mixed-Methods Study of Climate Change Extremes*. London, United Kingdom: SAGE Publications, Ltd.
- Temple, B. & Edwards, R. 2002. Interpreters / Translators and Cross-Language Research: Reflexivity and Border Crossings. *International Journal of Qualitative Methods*, 1 (2), 1-12.
- Temple, B., Edwards, R. & Alexander, C. 2006. Grasping at Context: Cross Language Qualitative Research as Secondary Qualitative Data Analysis. *Forum: Qualitative Social Research*, 7 (4), n/a-n/a.
- Themeßl, M. J., Gobiet, A. & Leuprecht, A. 2011. Empirical-Statistical Downscaling and Error Correction of Daily Precipitation from Regional Climate Models. *International Journal of Climatology*, 31 (10), 1530-1544.
- Thøgersen, S. & Heimer, M. 2006. Introduction. In: Heimer, M. & Thøgersen, S. (eds.) *Doing Fieldwork in China* Copenhagen, Denmark: NIAS Press, 1, 26. pp.
- Thulstrup, A. W. 2014. Plantation Livelihoods in Central Vietnam: Implications for Household Vulnerability and Community Resilience. *Norsk Geografisk Tidsskrift-Norwegian Journal of Geography*, 68 (1), 1-9.
- Thunø, M. 2006. In the 'Field' Together: Potentials and Pitfalls in Collobartive Research. In: Heimer, M. & Thøgersen, S. (eds.) *Doing Fieldwork in China* Copenhagen, Denmark: NIAS Press, 245, 261. pp.
- Tilt, B. 2008. Smallholders and the 'Household Responsibility System': Adapting to Institutional Change in Chinese Agriculture. *Human Ecology*, 36 (2), 189-199.

- Turner, A. G. & Annamalai, H. 2012. Climate Change and the South Asian Summer Monsoon. *Nature Clim. Change*, 2 (8), 587-595.
- Turner II, B. L. 2010. Vulnerability and Resilience: Coalescing or Paralleling Approaches for Sustainability Science? *Global Environmental Change*, 20 (4), 570-576.
- Turner, M. D. 2014. Political Ecology I: An Alliance with Resilience? *Progress in Human Geography*, 38 (4), 616-623.
- Turner, S. 2010a. Challenges and Dilemmas: Fieldwork with Upland Minorities in Socialist Vietnam, Laos and Southwest China. *Asia Pacific Viewpoint*, 51 (2), 121-134.
- Turner, S. 2010b. Research Note: The Silenced Assistant. Reflections of Invisible Interpreters and Research Assistants. *Asia Pacific Viewpoint*, 51 (2), 206-219.
- Unger, J. 2002. *The Transformation of Rural China* Armonk, N.Y.: M.E. Sharpe.
- Urry, J. 2000. *Sociology Beyond Societies : Mobilities for the Twenty-First Century* London: Routledge.
- Urry, J. 2007. *Mobilities* Cambridge: Polity.
- Vag, A., Jäger, J., Frühmann, J. & Grünberger, S. 2009. *Environmental Change and Forced Migration Scenarios: Synthesis Report*. Synthesis report. ATLAS Innoglobe. 81. p.
- van der Geest, K. 2011. North-South Migration in Ghana: What Role for the Environment? *International Migration*, 49, e69-e94.
- van der Geest, K., Vrieling, A. & Dietz, T. 2010. Migration and Environment in Ghana: A Cross-District Analysis of Human Mobility and Vegetation Dynamics. *Environment and Urbanization*, 22 (1), 107-123.
- Vincent, K., Cull, T., Chanika, D., Hamazakaza, P., Joubert, A., Macome, E. & Mutonhodza-Davies, C. 2013. Farmers' Responses to Climate Variability and Change in Southern Africa - Is It Coping or Adaptation? *Climate and Development*, 10.1080/17565529.2013.821052, 1-12.
- Walker, B., Abel, N., Anderies, J. M. & Ryan, P. 2009. Resilience, Adaptability, and Transformability in the Goulburn-Broken Catchment, Australia. *Ecology and Society*, 14 (1), n/a-n/a.
- Walker, B., Abel, N., Andreoni, F., Cape, J., Murdock, H. & Norman, C. 2014. *General Resilience: A Discussion Paper Based on Insights from a Catchment Management Area Workshop in South Eastern Australia*. Working Paper. 14.
- Walker, B., Gunderson, L. H., Kinzig, A., Folke, C., Carpenter, S. & Schultz, L. 2006. A Handful of Heuristics and Some Propositions for Understanding Resilience in Social-Ecological Systems. *Ecology and Society*, 11 (1), n/a-n/a.

- Walker, B., Holling, C. S., Carpenter, S. R. & Kinzig, A. P. 2004. Resilience, Adaptability and Transformability in Social-Ecological Systems. *Ecology and Society*, 9 (2), n/a-n/a.
- Wallerstein, I. M. 1974. *The Modern World-System* New York ; London: Academic Press.
- Wallerstein, I. M. 1979. *The Capitalist World-Economy : Essays* Cambridge: Cambridge : Cambridge University Press.
- Wallerstein, I. M. 1983. *Historical Capitalism* London: Verso.
- Wang, C., Rada, N., Qin, L. & Pan, S. 2014. Impacts of Migration on Household Production Choices: Evidence from China. *The Journal of Development Studies*, 10.1080/00220388.2013.866221.
- Wang, F. 2005. Can China Afford to Continue Its One-Child Policy? Asia Pacific Series, Issue 2005, 12. Honolulu: East-West Center.
- Wang, H.-J., Sun, J.-Q., Chen, H.-P., Zhu, Y.-L., Zhang, Y., Jiang, D.-B., Lang, X.-M., Fan, K., Yu, E.-T. & Yang, S. 2012. Extreme Climate in China: Facts, Simulation and Projection. *Meteorologische Zeitschrift*, 21 (3), 279-304.
- Wang, J., Gao, W., Xu, S. Y. & Yu, L. Z. 2012. Evaluation of the Combined Risk of Sea Level Rise, Land Subsidence, and Storm Surges on the Coastal Areas of Shanghai, China. *Climatic Change*, 115 (3-4), 537-558.
- Wang, J., Juang, J. & Rozelle, S. 2010. *Climate Change and China's Agricultural Sector: An Overview of Impacts, Adaptation and Mitigation*. International Centre for Trade and Sustainable Development; International Food & Agricultural Trade Policy Council. Switzerland and Washington: International Centre for Trade and Sustainable Development & International Food & Agricultural Trade Policy Council, 31.
- Wang, M. Z., Amati, M. & Thomalla, F. 2012. Understanding the Vulnerability of Migrants in Shanghai to Typhoons. *Natural Hazards*, 60 (3), 1189-1210.
- Wang, S. G. 2013. Reducing Poverty through Agricultural Development in China. *IDS Bulletin-Institute of Development Studies*, 44 (5-6), 55-62.
- Wang, W. W. & Fan, C. C. 2006. Success or Failure: Selectivity and Reasons of Return Migration in Sichuan and Anhui, China. *Environment and Planning A*, 38 (5), 939-958.
- Wang, X., Chen, R. J., Meng, X., Geng, F. H., Wang, C. C. & Kan, H. D. 2013. Associations between Fine Particle, Coarse Particle, Black Carbon and Hospital Visits in a Chinese City. *Science of the Total Environment*, 458, 1-6.
- Wang, X., Oropesa, R. S. & Firebaugh, G. 2013. Permanent Migrants to Cities in China: Hukou Origin and Earnings among Men in an Era of Economic Transformation. *Migration and Development*, 2 (1), 37-56.

- Wang, X. & Shen, Y. 2014. The Effect of China's Agricultural Tax Abolition on Rural Families' Incomes and Production. *China Economic Review*, 29 (0), 185-199.
- Warner, K. 2011. Environmental Change and Migration: Methodological Considerations from Ground-Breaking Global Survey. *Population and Environment*, 33 (1), 3-27.
- Warner, K. & Afifi, T. 2013. Evidence from 8 Countries on How Vulnerable Households Use Migration to Manage the Risk of Rainfall Variability and Food Insecurity. *Climate and Development*, 10.1080/17565529.2013.835707.
- Warner, K., Afifi, T., Henry, K., Rawe, T., Smith, C. & De Sherbinin, A. 2012. *Where the Rain Falls : Climate Change, Food and Livelihood Security, and Migration. Global Policy Report of the Where the Rain Falls Project.* CARE France United Nations University Institute for Environment and Human Security (UNU-EHS). Bonn, Germany: Care France & United Nations University Institute for Environment and Human Security (Unu-Ehs), 142.
- Warner, K., Afifi, T., Stal, M. & Dun, O. 2009. Researching Environmental Change and Migration: Evaluation of EACH-FOR Methodology and Application in 23 Case Studies Worldwide. In: Laczko, F. & Aghazarm, C. (eds.) *Migration, Environment and Climate Change: Assessing the Evidence*: Intl Organization for Migration, 197, 244. pp.
- White, G. 2011. *Climate Change and Migration : Security and Borders in a Warming World* New York ; Oxford: Oxford University Press.
- Whyte, M. 2004. Filial Obligations in Chinese Families: Paradoxes of Modernization. In: Ikels, C. (ed.) *Filial Piety : Practice and Discourse in Contemporary East Asia* Stanford, Calif.: Stanford University Press, 106, 127. pp.
- Wilby, R. L. & Dessai, S. 2010. Robust Adaptation to Climate Change. *Weather*, 65 (7), 180-185.
- Williams, J. W. & Jackson, S. T. 2007. Novel Climates, No-Analog Communities, and Ecological Surprises. *Frontiers in Ecology and the Environment*, 5 (9), 475-482.
- Wong, K. V., Paddon, A. & Jimenez, A. 2013. Review of World Urban Heat Islands: Many Linked to Increased Mortality. *Journal of Energy Resources Technology-Transactions of the Asme*, 135 (2).
- World Bank 2012. World Development Indicators. In: World Bank Data (ed.).
- Wu, W. 2010. Drifting and Getting Stuck: Migrants in Chinese Cities. *City*, 14 (1-2), 13-24.
- Wu, X. D., Yu, D. P., Chen, Z. Y. & Wilby, R. L. 2012. An Evaluation of the Impacts of Land Surface Modification, Storm Sewer Development, and Rainfall Variation on Waterlogging Risk in Shanghai. *Natural Hazards*, 63 (2), 305-323.
- Xie, J., Liebenthal, A., Warford, J. J., Dixon, J. A., Wang, M., Gao, S., Wang, S., Jiang, Y. & Ma, Z. 2009. *Addressing China's Water Scarcity: Recommendations for*

- Selected Water Resource Management Issues*. Report. International Bank for Reconstruction and Development / The World Bank. Washington DC: The World Bank, 198. pp.
- Xie, N., Xin, J. & Liu, S. 2014. China's Regional Meteorological Disaster Loss Analysis and Evaluation Based on Grey Cluster Model. *Natural Hazards*, 71 (2), 1067-1089.
- Xie, Y. & Zhou, X. 2014. Income Inequality in Today's China. *Proceedings of the National Academy of Sciences*, 111 (19), 6928-6933.
- Xinhua News Agency. 2011. *Death Toll Reaches 175 in South China Flooding since Early June* [Online]. Available: http://news.xinhuanet.com/english2010/china/2011-06/20/c_13940085.htm [Accessed 10/02/2015].
- Xinhua News Agency. 2014. *No.1 Central Document Targets Rural Reform* [Online]. Beijing: Xinhua News Agency. Available: http://www.china.org.cn/china/2014-01/20/content_31238939_2.htm [Accessed 02/06/2014].
- Xiong, W., Conway, D., Erda, L., Xu, Y. L., Ju, H., Jiang, J. H., Holman, I. & Li, Y. 2009. Future Cereal Production in China: The Interaction of Climate Change, Water Availability and Socio-Economic Scenarios. *Global Environmental Change-Human and Policy Dimensions*, 19 (1), 34-44.
- Xu, A., Xie, X., Liu, W., Xia, Y. & Liu, D. 2007. Chinese Family Strengths and Resiliency. *Marriage & Family Review*, 41 (1-2), 143-164.
- Xu, N. 2013. Pan Jiahua on Three Decades of Urbanisation in China. China Dialogue, Issue 15/10/2013, 3. p. London, Beijing, & San Francisco: China Dialogue.
- Xu, Y. 2001. Family Support for Old People in Rural China. *Social Policy & Administration*, 35 (3), 307-320.
- Yan, X., Bauer, S. & Huo, X. 2014. Farm Size, Land Reallocation, and Labour Migration in Rural China. *Population, Space and Place*, 20 (4), 303-315.
- Yang, X., Lin, E., Ma, S., Ju, H., Guo, L., Xiong, W., Li, Y. & Xu, Y. 2007. Adaptation of Agriculture to Warming in Northeast China. *Climatic Change*, 84 (1), 45-58.
- Yang, X. J. 2013. China's Rapid Urbanization. *Science*, 342 (6156), 310.
- Yang, Z. 2013. Demographic Changes in China's Farmers: The Future of Farming in China. *Asian Social Science*, 9 (7), 136-143.
- Yangang, F. & jisheng, L. 2014. The Modification of North China Quadrangles in Response to Rural Social and Economic Changes in Agricultural Villages: 1970–2010s. *Land Use Policy*, 39 (0), 266-280.
- Yao, Y. 2010. *Is the Era of Cheap Chinese Labour Over?* [Online]. The Economist. Available: <http://www.economist.com/economics/by->

[invitation/questions/era_cheap_chinese_labour_over](#) [Accessed 05/12/2014 2014].

- Yin, J., Yin, Z. & Xu, S. Y. 2013. Composite Risk Assessment of Typhoon-Induced Disaster for China's Coastal Area. *Natural Hazards*, 69 (3), 1423-1434.
- Yin, R. K. 2011. *Applications of Case Study Research*: Thousand Oaks; California : Sage.
- Yonetani, M. 2014. *Global Estimates 2014 : People Displaced by Disasters*. Internal Displacement Monitoring Centre, Norwegian Refugee Council. Geneva: Internal Displacement Monitoring Centre, N. R. C., , 64.
- You, J. 2014. Risk, under-Investment in Agricultural Assets and Dynamic Asset Poverty in Rural China. *China Economic Review*, 29, 27-45.
- Zhang, L. 2008. Conceptualizing China's Urbanization under Reforms. *Habitat International*, 32 (4), 452-470.
- Zhang, L. 2011. Farm Dependence and Population Change in China. *Population Research and Policy Review*, 30 (5), 751-779.
- Zhang, L. & Tao, L. 2012. Barriers to the Acquisition of Urban Hukou in Chinese Cities. *Environment and Planning A*, 44 (12), 2883-2900.
- Zhang, N. 2014. Performing Identities: Women in Rural–Urban Migration in Contemporary China. *Geoforum*, 54 (0), 17-27.
- Zhang, Q., Crooks, R. & Jiang, Y. 2011. *Environmentally Sustainable Development in the People's Republic of China: Visions for the Future and the Role of the Asian Development Bank*. Asia Development Bank. Manila, 31. p.
- Zhang, Q., Kobayashi, Y., Howell Alipalo, M. & Zheng, Y. 2012. *Drying Up: What to Do About Droughts in the People's Republic of China*. Asian Development Bank. Mandaluyong City: Bank, A. D., 68. p.
- Zhang, Q., Sun, P., Singh, V. P. & Chen, X. 2012. Spatial-Temporal Precipitation Changes (1956-2000) and Their Implications for Agriculture in China. *Global and Planetary Change*, 82-83, 86-95.
- Zhang, Q. F. & Donaldson, J. A. 2012. China's Agrarian Reform and the Privatization of Land: A Contrarian View. *Journal of Contemporary China*, 22 (80), 255-272.
- Zhang, W. 2002. Changing Nature of Family Relations in a Hebei Village in China. *Journal of Contemporary Asia*, 32 (2), 147-170.
- Zhang, X. L., Jiao, M. Y. & Chen, T. 2010. Mesoscale Analysis of a Heavy Rainfall Event Along the Huaihe River Valley During 8-9 July 2007. *Acta Meteorologica Sinica*, 24 (3), 365-379.
- Zhang, Y. L. & You, W. J. 2014. Social Vulnerability to Floods: A Case Study of Huaihe River Basin. *Natural Hazards*, 71 (3), 2113-2125.

- Zhao, J. Z., Luo, Q. S., Deng, H. B. & Yan, Y. 2008. Opportunities and Challenges of Sustainable Agricultural Development in China. *Philosophical Transactions of the Royal Society B-Biological Sciences*, 363 (1492), 893-904.
- Zhao, S. 2012. Privatization, Fdi Inflow and Economic Growth: Evidence from China's Provinces, 1978-2008. *Applied Economics*, 45 (15), 2127-2139.
- Zhao, Z. 2005. Migration, Labor Market Flexibility, and Wage Determination in China: A Review. *Developing Economies*, 43 (2), 285-312.
- Zhou, K. X. 1996. *How the Farmers Changed China : Power of the People* Boulder, Colo.: Westview Press.
- Zhu, L. 2014. Addressing Extreme Poverty and Marginality: Experiences in Rural China. *In: Von Braun, J. & Gatzweiler, F. W. (eds.) Marginality : Addressing the Nexus of Poverty, Exclusion and Ecology: Dordrecht; Heidelberg; New York; London : Springer*, 239, 255. pp.
- Zhu, N. 2002. The Impacts of Income Gaps on Migration Decisions in China. *China Economic Review*, 13 (2-3), 213-230.
- Zhu, X. 2012. Understanding China's Growth: Past, Present, and Future. *Journal of Economic Perspectives*, 26 (4), 103-24.
- Zhu, Y. 2003. The Floating Population's Household Strategies and the Role of Migration in China's Regional Development and Integration. *International Journal of Population Geography*, 9 (6), 485-502.
- Zhu, Y. 2007. China's Floating Population and Their Settlement Intention in the Cities: Beyond the Hukou Reform. *Habitat International*, 31 (1), 65-76.
- Zhu, Y. & Chen, W. 2010. The Settlement Intention of China's Floating Population in the Cities: Recent Changes and Multifaceted Individual-Level Determinants. *Population Space and Place*, 16 (4), 253-267.