



Contents lists available at ScienceDirect

World Development

journal homepage: www.elsevier.com/locate/worlddev

Household Livelihood Differentiation and Vulnerability to Climate Hazards in Rural China

Qing Tian^a, Maria Carmen Lemos^b

^a George Mason University, Fairfax, USA

^b University of Michigan, Ann Arbor, USA

ARTICLE INFO

Article history:

Available online xxx

Key words:

vulnerability
adaptation
exposure
sensitivity
adaptive capacity
livelihoods approach
complex processes
floods
Poyang Lake

SUMMARY

Rural households in the developing world increasingly participate in urban and broader economies. While nonfarm income may reduce their dependence on climate-reliant agricultural activities, how the diversification of income and livelihoods affects rural households' vulnerability is complex because of many interacting stressors at play. This study uses household survey data collected in the Poyang Lake area of China—a region historically vulnerable to flooding—to analyze rural vulnerability against the background of state-led development. We look at the three components of climate vulnerability: exposure, sensitivity, and adaptive capacity, and focus on examining households' allocations of assets and labor to illustrate the complex processes that affect rural livelihoods and households' adaptive capacity. We find that overall sensitivity to flooding has been reduced, particularly for those households with relatively high exposure. These changes suggest increased adaptive capacity and reduced flood vulnerability relative to the commune period and are the result of two main processes. First, the livelihoods of rural households have become increasingly differentiated amid broad industrial and urban development; and second, the presence of regional flood risk management has reduced exposure for agriculture-oriented households.

© 2017 Elsevier Ltd. All rights reserved.

1. Introduction

Researchers have long recognized the importance of examining vulnerability, climate adaptation and broader development in an integrated manner, especially in less developed areas (Adger, Huq, Brown, Conway, & Hulme, 2003; Eakin, Lemos, & Nelson, 2014; Kates, 2000; Lemos, Boyd, Tompkins, Osbahr, & Liverman, 2007; O'Brien *et al.*, 2004; Ribot, Najam, & Watson, 1996; Wilbanks & Kates, 2010; Tian, 2017). Today as rural households across the developing world increasingly participate in urban and larger economies, their land-use and livelihood decisions are critically affected by broader development dynamics, such as urbanization and state-led economic development (Eakin, Lerner, & Murtinho, 2010; Liu *et al.*, 2013; Seto & Reenberg, 2014; Seto *et al.*, 2012). While nonfarm income may decrease the dependence of rural livelihoods on natural resources and reduce their vulnerability to environmental hazards (Adger, 1999; Lemos, Lo, Nelson, Eakin, & Bedran-Martins, 2016; Nelson, Lemos, Eakin, & Lo, 2016), the processes through which these changes happen are complex and need to be better understood (Eakin *et al.*, 2010; Bedran-Martins and Lemos, *in press*).

This study attempts to illustrate these complex processes. We examine rural households' climate vulnerability against the back-

ground of urban and industrial development in China where rural livelihoods have been undergoing a transformation toward a non-farm orientation (Burnham & Ma, 2017; NPFPC, 2012; Peng, 2011; Siciliano, 2012). We focus on the Poyang Lake Region (PLR) of China, an important rice producing area for Jiangxi Province. The region has been historically subjected to flooding from Poyang Lake, China's largest fresh water lake. To mitigate the impacts from floods, people in the region have built levees throughout history. The levee system has been expanded and strengthened by the Chinese government since 1949, particularly in important agricultural areas and around urban centers, resulting in increased variability in levee quality across the region (see Section 3 for more detail).

We use a livelihoods approach to analyze the three components of vulnerability: exposure, sensitivity, and adaptive capacity (IPCC, 2014), and to explain the processes, which involve many different stressors at different scales, that shape and change rural households' flood vulnerability. We hypothesize that broader economic development (e.g., economic growth in the industrial and service sectors, urban development and expansion, liberated and expanded agricultural markets) and risk management infrastructure (i.e., levees) interact to shape flood vulnerability. Our analysis focuses on how local natural and geographical environments—interacting with macro-level development dynamics—mediate rural

<https://doi.org/10.1016/j.worlddev.2017.10.019>

0305-750X/© 2017 Elsevier Ltd. All rights reserved.

households' allocations of assets and labor and shape their livelihood choices. We examine how these choices in turn affect their vulnerability to flooding.

Specifically, we analyze how nonfarm employment in the urban and industrial sectors may reduce the sensitivity of rural livelihoods to flooding. We expect that local community characteristics—proximity to urban centers, farmland resources, and flood risk in particular—play an important role in the development of different income profiles that have different degrees of dependence on climate-reliant agriculture and may be correlated with households' past flood exposure. We also expect that levees may mitigate flood exposure particularly for households with relatively high dependence on agriculture.

Next, we review the literature that grounds this analysis (Section 2) and then describe the study area (Section 3). The core of the paper uses household-level data to identify major income profiles that represent different economic activities (Section 4), examines changes in the sensitivity of rural livelihoods and explores the complex processes that shape the households' flood vulnerability (Section 5). We conclude with a brief discussion of the implications of our findings for scholarship and policy.

2. Livelihoods approach and climate vulnerability

In the now classic conceptualization of the IPCC framework, climate vulnerability has three major components: exposure, sensitivity, and adaptive capacity. While exposure describes the nature and degree to which a system is exposed to significant climatic variations, sensitivity reflects the degree to which a system is affected by climate-related stimuli. Adaptive capacity is defined as “the ability or potential of a system to respond successfully to climate variability and change, and includes adjustments in both behavior and in resources and technologies.”

To understand a household's well-being, a livelihoods approach examines how households allocate assets to produce livelihoods (Bebbington, 1999; Ellis, 1998). Because this approach can provide useful insight about how households are exposed, sensitive, and able to resist or recover from climate-related impacts (IPCC, 2014), researchers have increasingly used it to illuminate the complex relationship between development and the ability of households to manage climate risk and adapt to climate variability and change (Bebbington, 1999; Eakin, 2005; Eriksen, Brown, & Kelly, 2005; Ford & Smit, 2004; Lemos *et al.*, 2016; Osbahr, Twyman, Adger, & Thomas, 2008; Paavola, 2008; Rogers & Xue, 2015; Scoones, 1998; Scoones, 2009).

An important component of livelihoods is household income (Bebbington, 1999; Lemos *et al.*, 2016; Scoones, 1998). Connections with urban and broader markets bring changes to rural households' economic activities and income composition. Empirical research suggests that rural households near urban centers have benefited from nonfarm opportunities and access to markets (Hoang, Dinh, & Nguyen, 2008; Tian, Guo, & Zheng, 2016) and that participation in urban economies has contributed to income diversification and rural poverty reduction (De Janvry, Sadoulet, & Zhu, 2005; Deshingkar, 2006; Glauben, Herzfeld, Rozelle, & Wang, 2012). However, the diversification of rural livelihoods may be transient because migrant workers lack professional skills (Dzanku, 2015). In addition, greater livelihood diversity may not be associated with higher levels of household well-being (Gautam & Andersen, 2016); rather it is the types of activities that are important in shaping household well-being (Martin & Lorenzen, 2016). By examining a household's economic activities, scholars can better understand the household's sensitivity to climate hazards (Nelson *et al.*, 2016), especially for rural households where agricultural activities are in general more likely to be influ-

enced by climate events. Access to climate-independent assets can also influence a household's wealth and capacity to manage risk and cope with climate impacts, thus modulating vulnerability (Eakin *et al.*, 2014).

To fully understand vulnerability, we need to look at sensitivity and exposure together: if a household has high exposure and is highly sensitive to flooding, it is likely vulnerable (Tian, Brown, Bao, & Qi, 2015a; Tian, 2017). Yet, adaptive capacity is dynamic by nature, and it can be difficult to measure directly, especially because it is a latent condition activated only when households are affected by specific climate events (Engle, 2011). Moreover, to adapt to climate variability and change, people do not only need resources and technologies, but they must anticipate risks, be willing to make behavior adjustments and have the ability to mobilize those resources in the right combination to make appropriate adjustments (Nelson, Adger and Brown, 2007; Eakin *et al.*, 2014).

In this study, we use a two-pronged approach to address this issue. First, we look at changes in sensitivity relative to exposure to gain insight into adaptation, and second, we investigate the processes underlying a household's actual adaptation to gain insight about what affects its adaptive capacity. Though we cannot directly measure a household's willingness and ability to make appropriate adjustments, we can infer a household's adaptation from changes in its economic activities. Specifically, if a household, especially one with high past exposure to climate-related impacts, changes its economic activities in a way that results in reduced sensitivity over time, it is adaptive and is adapting in the right direction.

Household adaptation, defined this way, manifests through the household's livelihood choices, and its capacity to adapt is therefore embedded in the livelihood decision-making processes. By analyzing how a household allocates assets and labor to produce livelihoods, we can gain insight about the complex processes affecting household adaptation as well. These processes include macro-level factors such as urbanization and broader economic development, local social and environmental contexts, as well as risk management infrastructure such as levees. A good understanding of these processes can provide guidance for policy interventions to effectively enhance adaptive capacity and improve overall well-being of rural households (Adger *et al.*, 2003; Lemos, Boyd, Tompkins, Osbahr, & Liverman, 2007a, 2007b; Vincent, 2007; Engle, 2011; Hill, 2013).

3. Study area

The Poyang Lake region covers a total area of 20,970 km², including ten counties and two cities (Nanchang and Jiujiang) (Figure 1). According to the Chinese Census in 2010, the total population in PLR was 9.2 million. About 3.06 million of the PLR population lives in the two cities; and 78.3% of the population outside of the two cities is classified as rural. To put PLR in perspective, Jiangxi Province is about 166,900 km² and has a population of 44.6 million. According to the Jiangxi Statistical Year Book in 2004, PLR produced 19%, 32% and 35% of the total grain, cotton and aquaculture products, respectively, for Jiangxi Province. Rice is a traditional and still dominant crop in the region. Rice can be grown once in a year (single cropping), or twice on the same plot (double cropping). Because nonfarm work generally brings higher returns than rice cultivation on a small scale, double cropping has been converted to single cropping in some areas, especially in those villages with poor farmland resources (Shi, Heerink, & Qu, 2007; Tian *et al.*, 2015b).

Flooding from Poyang Lake is a well-known hazard in PLR and constrains agricultural and economic development (Huang & Dai, 2004; Jiang *et al.*, 2008; Ma, 2007; Shankman & Liang, 2003;

Download English Version:

<https://daneshyari.com/en/article/7391639>

Download Persian Version:

<https://daneshyari.com/article/7391639>

[Daneshyari.com](https://daneshyari.com)