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Household responses to climate-related hazards in four Latin American cities: A conceptual framework and exploratory analysis

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ABSTRACT

Vulnerability has been considered as a focal topic in various fields of study relating to human–environmental interactions, including climate change impacts, disaster and risk, and sustainable development. As hotspots for both the causes and consequences of climate change, urban areas have become increasingly visible in recent vulnerability and adaptation research. The influencing factors of local populations' responses to climate change hazards have been relatively understudied in recent literature on vulnerability to global environmental change. In this study, we developed a synthetic conceptual framework of urban households' responses to climate-related hazards, and conducted a preliminary analysis of its applicability using household survey data from four major Latin American cities (Bogotá, Colombia; Buenos Aires, Argentina; Mexico City, Mexico; and Santiago, Chile). The analysis revealed that variables measuring perceived impacts and the sensitivity and social asset aspects of social vulnerability were particularly related with household response to the safety and health risks of climate hazards. These results provide general support for our conceptual approach to vulnerability focusing on human response actions.

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1. Introduction

As hotspots for both the causes and consequences of climate change, urban areas have become increasingly visible in recent vulnerability and adaptation research. The study of vulnerability in general and urban vulnerability in particular, is characterized by diverse conceptual approaches and research paradigms (Adger, 2006; Eakin and Luers, 2006; Romero-Lankao and Qin, 2011). The capacity for climate change adaptation holds a pivotal role in integrative vulnerability frameworks (e.g., IPCC, 2007, 2014; Turner et al., 2003), and is considered as one of the most influential factors of subsequent response actions. Climate change adaptation capacity and actual responses are dynamic, context-contingent processes varying across different spatial scales. Although there has been emerging research interest in environmental governance and institutional responses at the city, region, and state levels (e.g., Baker et al., 2012; Brooks et al., 2005; Næss et al., 2005; Romero-Lankao et al., 2013a), less is known about the determinants of community residents' coping and adaptation behaviors, particularly in urban areas, in response to climate change impacts.

The frequency and magnitude of many natural hazards in cities (e.g., heat waves, floods, and droughts) are expected to be exacerbated by climate change (Revi et al., 2014; Satterthwaite et al., 2007). A focus on urban populations' responses to such events can help further synthesize the climate change adaptation and disaster-risk analysis fields, and contribute to an integrated systems approach to vulnerability and risk (IPCC, 2012; Schipper, 2009). While actual human responses have received increased attention in recent analysis of vulnerability to climate change, residential prevention and mitigation strategies have formed a major line of inquiry in disaster research (cf. Bubeck et al., 2012). Furthermore, some key cognitive explanatory factors of individual or household actions identified in the disaster-risk literature, such as risk perception (or the social construction of risk), have begun to be systematically examined in existing empirical research on climate change adaptation (Grothmann and Patt, 2005).

The primary purpose of this study is to explore the relationships between factors within major vulnerability dimensions and urban populations' responses to environmental hazards related to climate change. Linking together relevant insights from the climate social science and the disaster risk reduction communities should lead to increased understanding of urban vulnerability and adaptation processes. In this study, we developed a synthetic conceptual framework of urban households' responses to climate-related hazards, and conducted a preliminary analysis of its applicability using household survey data from four large Latin American cities (Bogotá, Colombia; Buenos Aires, Argentina; Mexico City, Mexico; and Santiago, Chile). The organization of the rest of this paper is as follows. First, we provide an overview of the conceptualization of vulnerability to climate change and depict an analytic model linking vulnerability, risk perception, and human responses. The next section describes the four study cities, data collection, variables of interest, and statistical techniques. Main results from the multi-phase analysis of the survey data are then presented. Finally, we conclude with interpretations of major findings of the analysis and remark on their implications for future research.

2. A conceptual framework of urban household responses to climate-related hazards

2.1. Conceptualization of vulnerability

Vulnerability has been considered as a focal topic in various fields of study relating to human-environmental interactions, including climate change impacts, disaster and risk, and sustainable development. Although there is no shared, standard definition of this key concept, the variety of current conceptual approaches to vulnerability can be categorized into three main research lineages: risk-hazards, political economy or ecology, and ecological resilience (Adger, 2006; Cutter et al., 2003; Eakin and Luers, 2006; Füssel, 2007; Kasperson et al., 2005; Mclaughlin and Dietz, 2008; Romero-Lankao and Qin, 2011). The risk-hazards research tradition mainly conceives vulnerability as an outcome determined by exposure to environmental shocks and stresses, as well as sensitivity of people, places and systems to these hazards (e.g., Bell et al., 2008; Burton et al., 1978; Haque and Blair, 1992). By contrast, the political

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