



## Social capital and community preparation for urban flooding in China



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### ABSTRACT

Social capital can enhance community resilience to environmental change. Productive and trusted relations among social actors and effectual social norms can help local residents share resources, information and risks. The main objective of our study is to understand the ways in which social attributes and risk considerations influence adoption of resilient economic measures by individuals for reducing potential losses due to catastrophic rainstorm and flooding. This article provides evidence from China on how social capital contributes to anticipatory adaptation to environmental change. The inquiry is based on structured interviews with local residents of Tianjin, a flood-prone port city in China, and a standard regression analysis. Findings show that the intention to make preparation increases with the levels of social expectation, social relationship, and institutional trust. Perceived risk and damage experience, however, have no significant impacts. This suggests that building social capacity and trust will be more effective in enhancing community resilience than merely increasing awareness of hazard risks. We call for greater efforts on strengthening the capacity of formal and informal communal institutions. The structural changes required, however, are challenging.

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### 1. Introduction

Swathes of land are exposed to climate change disturbance as average temperatures are rising in the coming decades. The warming climate brings more energy into the meteorological system and results in a more vigorous hydrological cycle (Güneralp, Güneralp, & Liu, 2015). Some regions will receive more extreme precipitation and torrential rains. Coastal low-lying built-up areas are likely to experience rainstorm waterlogging and inundation more often than before. Older capital cities, in which human activities and settlements are concentrated and urban drainage systems have reached their capacity, are particularly vulnerable.

Middle-income countries, such as China, are economic victims of abrupt climate change. According to the World Bank (2010), natural hazards in the past 40 years accounted for a total of US\$2,300 billion in economic costs (in 2008 dollars). Middle-

income countries incur the greatest proportional damage – more than poorer countries with few assets and richer countries which, with more capital, can more effectively prevent damage. Beijing, the capital of People's Republic of China, recorded a total economic damage of over ¥10 billion Chinese Yuan (approx. USD\$1.5 billion) and a large number of casualties (77 deaths and 1.6 million people affected) in a catastrophic rainstorm event in 2012 (Wu, 2012). Other megacities in China, such as Shanghai, Guangzhou, Tianjin, and Shenzhen, are also exposed to high risks of rainstorm waterlogging, flooding and/or hurricanes (Xie, Lo, Zheng, Pan, & Luo, 2014). The changing climate threatens to increase the economic burdens on residents and communities by an order of magnitude.

Enhancing resilience to these impacts is a pressing issue. This can be achieved by encouraging residents to adjust household plans in ways that can reduce their potential economic losses from future extreme weather events, such as taking out flood insurance and diversifying income sources (Goulden, Adger, Allison, & Conway, 2013; Keil, Zeller, Wida, Sanim, & Birner, 2008; Lo, 2013). In developing countries, however, individuals and households encounter many barriers to adapting to climate change (Le Dang, Li, Nuberg, & Bruwer, 2014; Suckall, Tompkins, & Stringer, 2014). One

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of these barriers is the lack of, or misperception of, information on hydrological risks. It is often assumed that the intention to make preventive arrangements for flooding is a function of perceived risk (Kunreuther, 1996, 2006). Misperception and myopic attitudes would result in delays or failures in undertaking preventive actions ahead of time to reduce the potential impacts of natural hazards on households and communities. In reality, many ordinary people tend to see the likelihood or severity of a natural hazard event causing damage to their property and affecting their livelihood as being sufficiently low. Systematic misperception of flood risks is identified as the main reason for poor or inadequate preparation for catastrophic flooding events (Kunreuther, 1996, 2006; Miceli, Sotgiu, & Settanni, 2008).

However, recent research has suggested that the importance of risk perception has been overstated. Based on a German case study, Bubeck, Botzen, Kreibich, and Aerts (2013, p. 1336) conclude that “risk perceptions rarely relate significantly to improved flood mitigation behaviour”. An Australian survey reported by Lo (2013) has come to the same conclusion. More evidence can be found in Bubeck et al.’s (2012) meta-analysis of 16 relevant empirical studies. Rather than taking risk perception (and hazard experience) for granted, researchers have increasingly turned their focus toward social capital, which refers to the structure of relations among social actors (Coleman, 1990; Pretty & Ward, 2001). Social capital can help enhance the capacity of households and communities to cope with climate change impacts (Bihari & Ryan, 2012; Goulden et al., 2013), although in some cases it contributes to vulnerability (Wolf, Adger, Lorenzoni, Abrahamson, & Raine, 2010). Variations in the level and form of social capital could explain people’s willingness to make hazard adjustments. The quality of social norms and interaction with people around and the community has significant implications for anticipatory adaptation to climate change (Eriksen & Selboe, 2012; Frank, Eakin, & López-Carr, 2011).

This research is situated in the context of a developing country in search of more effective ways for enhancing community resilience to extreme weather events and reducing burdens on local communities. We focus on voluntary economic preparation at the household level, which is an area of research that requires more attention than it has received, given its practical implications for state economic planners and aid organizations (Alinovi, Mane, & Romano, 2009; World Bank, 2010). Local research efforts remain inadequate in China, which is home to a great number of flood-prone and densely populated cities and towns. Existing Chinese studies have centred on the effects of human cognition and hazard experience in driving behavioral response (Ge, Xu, Gu, Zhang, & Chen, 2011; Huang, Duan, Bi, Yuan, & Ban, 2010; Lo & Cheung, 2015; Yu, Wang, Zhang, Wang, & Wei, 2013; Zheng & Dallimer, 2015). Few attempts have been made to utilize the concept of social capital. We bring the idea of economic resilience (Alinovi et al., 2009; Rose, 2004, 2007) together with investigations of the role of social capital in fostering behavioral adjustments to environmental change. Findings will be useful for identifying critical factors influencing the intention to act and formulating strategies for promoting risk management and preparation for extreme weather events at the household level.

This paper reports a quantitative study aimed at examining how social attributes and risk considerations influence voluntary adoption of resilient economic measures by individuals. Evidence was solicited from structured interviews with local residents of Tianjin, China. In the next section, we further elaborate on the conditions and utility of social capital. Then, we introduce the study area and survey instrument, followed by a statistical analysis of survey data. In the last section, we summarize findings and reflect on the issues being addressed.

### 1.1. Social capital and adaptation to environmental change

Social capital captures the idea that social relations and social norms form the basis of sustainable communities. It is generated and accumulated in the processes of social interaction and engagement with social networks and institutions, both formal and informal ones, yielding a wide range of economic and societal benefits. While Coleman (1990) understands social capital as a largely unintentional outcome of social interactions and organization, Putnam (1995, p. 664–665) defines it as an enabler of collective action: “features of social life – networks, norms and trust – that enable participants to act together more effectively to pursue shared objectives”. Pelling and High (2005) describe Putnam’s (1995) definition as the most frequently used and widely accepted one, which is therefore adopted for the present paper.

Social scientists have found the concept with multiple, analytically distinctive dimensions. Pelling and High (2005, p. 310), for example, note that social capital consists of two complementary components, namely, interpersonal relationship, and trust and reciprocity. Interpersonal relationships are developed from social ties, networks, and connections. Extensive and close interpersonal relationships are an outcome of trust and reciprocity, which reduce transaction costs and encourage cooperative behavior. Conformity to common expectations may also nurture social capital. As Pretty and Ward (2001, p. 211) suggest, the four critical aspects of social capital are 1) relations of trust; 2) reciprocity and exchanges; 3) common rules, norms and sanctions, and; connectedness, networks and groups. Adger (2003, p. 389) describes the concept in similar terms, encompassing relations of trust, reciprocity and exchange, evolution of common rules, and networks. The first, second and fourth dimensions outlined by Pretty and Ward (2001) and Adger (2003) match the two conceptual components identified by Pelling and High (2005), while the third dimension has nuanced connotations. Common rules, norms and sanctions render other people’s action predictable, reduce uncertainties in the outcomes of a particular action, and give individuals the confidence to invest in related activities. These manifestations of social capital are conducive to motivating collective action that would otherwise be deemed to be too costly to undertake.

Social capital among members of a community is a key determinant of its vulnerability and resilience to environmental changes and uncertainties (Adger, 2000, 2003; Barnett & Eakin, 2015; Frank et al., 2011; Goulden et al., 2013; Pelling, 2011; Wilson, 2015). Adger (2003, p. 401) has argued that “many aspects of adaptive capacity reside in the networks and social capital of the groups that are likely to be affected”. The structure and quality of social relations select what impending changes to act upon and determine the type and range of options for coping with these changes. Frank et al. (2011) find that the ways in which Mexican farmers understand and respond to climate-related threats to their welling and livelihoods are shaped by their perception of themselves in relation to others in the community, whereas risk perception and experience alone do not have significant influence on the motivation to adopt adaptive measures. Similarly, Goulden et al. (2013) report that the social connections among Ugandan villagers contribute to household resilience by facilitating livelihood diversification through providing access to resources and livelihood opportunities, access to credit, reducing costs of engaging in activities, facilitating migration, etc. Social capital links give households more opportunities for mitigating and spreading the risks of environmental change.

Yet, the accumulation of social capital is not necessarily a social ‘good’ and may create perverse incentives undermining adaptive capacity (Pelling & High, 2005; Pelling, 2011). Established networks, norms and trust, in Putnam’s (1995) terms, may perpetuate

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