Cultural perceptions of hazard and risk in a dynamic environment

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Abstract

In the Bailong River corridor, Gansu, China, an estimated 1.7 million people are threatened by geohazards including earthquakes, landslides and debris flows, flooding and extreme rainfall. The area is also undergoing rapid economic growth and infrastructure development. This paper reports on recent work exploring the physical and social systems and their interactions, and highlights the need for further multi-disciplinary research required to better understand human-landscape interactions in such dynamic environments. Knowledge of geohazard processes (including responses to rainfall, mapping of susceptibility, monitoring and triggering conditions for disaster events) and their interactions with society is advancing, but there is still much further work required to better understand how people living with risk perceive and adapt to their environment. Perceptions of risk are contextual, and influenced by culture and worldview; while society and culture may also be shaped by hazards, for example in the local knowledge and coping mechanisms which reduce risk. There is a need to answer questions such as how perceptions compare with scientifically-derived conclusions about hazard and risk? And can they inform policy that will reduce disaster risk?

Keywords: Geohazard; Risk perception; Culture; Dynamic environment.

The Bailong River corridor in southern Gansu, China, is a dynamic environment covering an area of around 18,000 km^2. It comprises more than 1,400 catchments and is home to two million people, of which an estimated 1.7 million are threatened by geohazards, including 700 landslides (Meng 2018). Earthquakes, landslides and debris flows, flooding and extreme rainfall affect people, services and infrastructure, often compounding and interacting to create complex multi-hazards. Recent examples include the Zhouqu debris flow disaster in August 2010, in which 1,765 people died (Dijkstra et al. 2012), and the upstream flooding of Nanyu village following blockage of the Bailong River by a landslide in July 2018 (Fan 2018). When considering (geo-)risk in dynamic environments, it is essential to explore the physical/natural and human/social systems, and their interactions.

This neo-tectonically active study area is particularly susceptible to geohazards, including landslides and debris flows (Dijkstra et al. 1993). Significant research has led to a better understanding of the physical processes involved, including responses to rainfall (Chen et al. 2018, Bai et al. 2014), mapping of susceptibility (Bai et al. 2012), monitoring rates of movement with remote-sensing (Zhang et al. 2018) and understanding triggering conditions for disaster events (Tang et al. 2011; Dijkstra et al. 2012).

The Bailong River corridor is also undergoing rapid population growth and economic development characterised by large infrastructure projects such as Lanyu Railway and Lanhai expressway. Researchers have been exploring the links between human activity and geohazards in this area; e.g. He et al. (2018) found that land use change (agricultural land to residential and industrial sites) was accelerating, potentially enhancing risk through increased likelihood of hazards occurring and greater socio-economic impacts; Zhang et al. (2012) found a correlation between human activity and geohazards in the Bailong River Basin, with sixty per cent of settlements situated in hazardous areas such as debris flow fans.

Knowledge of geohazard processes and their interactions with society is advancing, but there is still much further work required to better understand how people living with risk perceive and adapt to their environment. Bankoff (2001) describes how society and hazards can mutually influence each other, in that human activity can affect the impact of a hazard, while society and culture may also be shaped by hazards, for example in the local knowledge and coping mechanisms which reduce risk. Risk is thus a socio-culturally produced concept, and the perception of risk varies between individuals and groups depending on previous experiences, beliefs and underlying worldview. In discussing the 1755 Lisbon earthquake, Dynes (2000) finds that "the meaning of a disaster is always interpreted in terms of the existing cultural context" (p.110) and that "the understanding of the effects of a disaster depends on a knowledge of particular social and behavioural patterns" (p.111). The implication is that we cannot separate the cultural and social context from the physical and natural hazards in our understanding of risk.

Zhang et al. (2018) look at how disaster management policy in China has evolved since 1945. They point out that previously, disaster management policies have focused strongly on emergency response and preparedness. The 2003 SARS outbreak and the 2008 Sichuan earthquake were "focusing events" highlighting the need for early warning and emergency response mechanisms to enhance government capacity to respond (2003) and an effective coordination mechanism in disaster response for government (central and local) as well as non-governmental organisations. There is also a growing realisation that challenges were related not only to technical capacity, but also to society's awareness of risk, as demonstrated by the Ministry of Civil Affairs (responsible for disaster management) producing "Guidance on Supporting and Guiding Social Forces to Participate in Disaster Relief".

In considering then the wider question of how people can live safely in dynamic environments, this paper notes the advances in understanding the physical processes associated with geohazards, but emphasises the need for further multi-disciplinary research to explore the social and cultural perceptions of risk in the Bailong River corridor by answering the following questions: What other sources of knowledge about the landscape exist, for example from those who live and work there? How are perceptions of risk formed and influenced by individuals, "communities" and society as a whole? And how do these perceptions compare with scientifically-derived conclusions about hazard and risk? Can they inform policy that will reduce disaster risk?

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