



Disaster risk reduction among households exposed to landslide hazard: A crucial role for self-efficacy?

K. Mertens^{a,*}, L. Jacobs^b, J. Maes^{a,b}, J. Poesen^a, M. Kervyn^b, L. Vranken^a

^a Department of Earth and Environmental Sciences, KU Leuven, Geo-Instituut, Celestijnenlaan 200E, B-3001 Leuven-Heverlee, Belgium

^b Department of Geography, Vrije Universiteit Brussel, Pleinlaan 2, B-1050, Brussels, Belgium

ARTICLE INFO

Keywords:

Natural hazard
Disaster prevention measures
Protection motivation theory
Sub-Saharan Africa
Threat appraisal
Coping appraisal

ABSTRACT

Natural hazards have a large impact on household livelihoods worldwide, especially in the Global South. Yet, literature on the adoption of risk reduction measures at household level remains scattered and inconclusive. This study combines geographical data with an original cross-sectional household survey to investigate the relation between individual land use plans and both exposure to and experience with a natural hazard. Regressions are used to test the protection motivation theory (PMT) and to investigate the link between intentions to plant trees to reduce landslide risk and past experiences, actual exposure, perceived threat and perceived capacity to prevent the occurrence of landslides. The results show that respondents in our study area in Uganda are well aware of landslide risk and believe trees are effective in landslide susceptibility reduction. Yet, those farmers that would benefit most from reducing landslide susceptibility by planting trees have the lowest intention to do so. A low self-efficacy among exposed farmers is proposed to explain this result. This finding has important implications for disaster risk reduction and land use policies and leads to recommendations on how governments and development agents should communicate about landslide risk.

1. Introduction

Landslides are defined as “the movement of a mass of rock, debris or earth down a slope”. As they are causing small, but sometimes frequent events that affect millions of people worldwide, landslides have been called ‘an extensive disaster’ (Cruden and Varnes, 1996; UNISDR, 2013).

The Sendai Framework for Disaster Risk Reduction (DRR) stresses the importance of an “all-of-society engagement”, fostering an “inclusive, accessible and non-discriminatory participation” towards disaster risk reduction (UNISDR, 2015a). This aligns with the idea of an integrated risk management, which combines the implementation of risk reduction measures at both household (HH) and aggregated level (Bubeck et al., 2013; De Moel et al., 2011). The dispersed, small-scale character of landslides limits the scope for hazard-preventing measures and land use planning at an aggregate policy level. Therefore, disaggregated land use planning at household level is important in landslide prone areas and this holds particularly for remote and developing regions where protection provided by the state is limited (UNISDR, 2015a,b).

Recent research finds, however, that the adoption of precautionary measures, like *ex ante* land use planning for risk prevention and mitigation, among exposed populations is often limited (Bubeck et al.,

2012). Moreover, correlations between risk perception and the intention to adopt mitigation measures is generally weak (Bubeck et al., 2012; Wachinger et al., 2013). The weakness of this correlation has led to the term ‘risk perception paradox’, which has been explained by various theoretical arguments (Wachinger et al., 2013). A first possible reason is related to a methodological problem of feed-back loops (i.e. unaddressed reversed causality) in cross-sectional studies (Bubeck et al., 2012; Weinstein and Nicolich, 1993). Previously adopted disaster risk reduction measures among populations with a high risk perception might negatively affect the current intention to take measures. Cross-sectional studies that do not take this into account can therefore erroneously find that more exposed individuals have a low intention to take measures (Siegrist, 2012).

Another set of explanations for this ‘paradox’ relates to individual decision making: the benefits of not taking measures might outweigh costs; individual HHs might not feel responsible for taking precautionary measures (lack of agency); or they could lack access to necessary resources (Fothergill and Peek, 2004; Wachinger et al., 2013). Finally, the protection motivation theory (PMT) has proposed non-rational psychological explanations for the lack of precautionary measures among exposed HHs (Grothmann and Reusswig, 2006; Rogers, 1983, 1975). In the PMT, developed by Rogers (1975, 1983), decision

* Corresponding author.

E-mail address: kewan.mertens@ees.kuleuven.be (K. Mertens).

making in response to threats is determined by both the individuals' threat appraisal and their coping appraisal. The model is related to the theory of reasoned action and the social cognitive theory (Ajzen, 1991; Bandura, 1991). It has been widely used in health psychology and is increasingly being used to explain protective behaviour in the presence of natural hazards (Grothmann and Reusswig, 2006; Milne et al., 2000; Poussin et al., 2014). Frequently, these studies argue that both threat appraisal and coping appraisal should be high in order to foster protective behaviour (e.g. de Boer et al., 2015; Grothmann and Reusswig, 2006).

This is in line with recent trends in (behavioural) economics on decision making under risk, which stress the importance of internal constraints, in addition to external constraints like access to resources and technologies (Dalton et al., 2016; Wuepper and Lybbert, 2017). While it is increasingly acknowledged that internal constraints, like coping appraisal and self-efficacy, do play a crucial role, literature on such constraints is still emerging (Wuepper and Lybbert, 2017). Therefore, this study aims to assess which internal factors directly, or indirectly, prevent vulnerable individuals from taking preventive measures against one specific natural hazard, being landslides.

As climate change and population growth are expected to increase the frequency and severity of disaster impacts, understanding the internal and external factors that determine the adoption of mitigation measures at HH level is crucial for developing adequate policies around the world. This is particularly relevant for countries in the Global South, as these are most likely to be severely affected by climate change (UNISDR, 2015a). To our knowledge, there is still little understanding of internal constraints that hamper land use management for disaster risk reduction in the Global South.¹ This is in sharp contrast with an emerging literature on psychological constraints to e.g. the adoption of preventive measures against floods in Western countries (Kellens et al., 2013; Tierney et al., 2001). Yet, it is recognized that differences in culture, level of education, institutional context and nature of the risk are all likely to be important factors that shape responses to threats (Tansey and O'riordan 1999; Kellens et al., 2013).

The objective of the current study is to investigate response intentions to landslide hazard in the socio-economic and cultural context of Uganda. We find a negative correlation between exposure and intentions to plant trees and explore innovative explanations for this risk perception paradox. In particular, we aim at understanding the internal constraints that are preventing exposed farmers to adopt adequate land uses for the prevention of landslides. We show that farmers are well aware of landslide risk and do have a high threat appraisal, but that they do have a low self-efficacy. We therefore conclude that respondents fall into what has been called a 'fatalism trap', effectively fearing landslides but not believing that something can be done about it. This finding is new to the literature on protective behaviour in the presence of natural hazards, but not to the literature on the protection motivation theory as a whole, and thus provides new insights into behavioural responses in the presence of disaster risk (Bubeck et al., 2012). Geographical information on landslide susceptibility is combined with subjective perceptions and actual hazard experiences at the HH level, thereby allowing to disentangle the effect of exposure from actual experience and perceptions. Our database is unique since it combines information from a structured HH survey with an estimation of landslide exposure and information on the intentions to implement a specific mitigation measure at plot level.

¹ An important exception is the recent study on drought in Ethiopia (Gebrehiwot and van der Veen, 2015).

2. Theoretical framework

2.1. The protection motivation theory and the risk perception paradox

The protection motivation theory (PMT) relates the intention of an individual to adopt protective measures to its threat appraisal and its coping appraisal (Grothmann and Reusswig, 2006; Rogers, 1983, 1975).² The threat appraisal factor consists of a perceived susceptibility and a perceived severity component, which respectively measure the perceived likelihood that a devastating event occurs and the perceived impact this event can have upon occurrence. The coping appraisal factor, on the other hand, consists of an individual's self-efficacy, which is the perceived capacity of this individual to take action, and the protective response efficacy, which is the perceived efficacy of a specific protective response (Grothmann and Reusswig, 2006; Zaalberg et al., 2009).³ A growing body of literature stresses the importance of coping appraisal for the intention to adopt mitigation measures against natural hazards (Grothmann and Reusswig, 2006; Poussin et al., 2014; Zaalberg et al., 2009). Additionally, the cost of a specific measure is sometimes included as a third element in the coping appraisal component, as this determines whether the individual considers the measure to be relevant and within reach (Fothergill and Peek, 2004). This approach allows a more complete characterisation of internal and external constraints to the adoption of mitigation measures, but increases the risk of covariance between variables, thereby potentially blurring the results. It has been argued that perceived cost is negatively correlated with self-efficacy (Weinstein, 1993).

Some debate still exists regarding the relation between the various components of the PMT. While some researchers argue that the relation between the various components is merely additive, others argue that multiplicative interactions could arise between the aggregate factors of threat and coping appraisal. A detailed overview of this theoretical debate is presented in the Appendix A Table A3. Following the multiplicative interpretation, recent studies that made use of the PMT argue that a high threat appraisal combined with a low coping appraisal could lead to a non-protective response, like fatalism and wishful thinking (e.g. Grothmann and Reusswig, 2006; Zaalberg et al., 2009). A non-protective response thus arises among individuals who know there is a hazard, but do not trust their own capacity to do something about it, either because they do not trust their own capacity to take action or because they think the potential actions are ineffective.

The strength of the PMT is that it does not assume strict rationality of the agents and allows for heuristics and biases (Martin et al., 2007; Tierney et al., 2001). It does not make the frequent assumption that high risk perception will automatically lead to personal protection and thereby offers an explanation for the risk perception paradox (Tierney et al., 2001; Wachinger et al., 2013). While the PMT theory aims at explaining the intention to adopt protective measures, a strong correlation between intention and actual implementation of the protective measure has been observed in previous studies (Ajzen, 1991; Fishbein and Ajzen, 1975).

² There are several alternative models to explain protective intentions, like the Protective Action Decision Model (PADM) and the Trans-theoretical model (TTM). Lindell and Perry (2012) compare the PADM and the PMT. They argue that the PMT's emphasis on self-efficacy might be more relevant in case the focus is on one single protective action, while a focus on task demands, like in the PADM, is more relevant when several measures are to be compared (Lindell and Perry, 2012). As we will look at one single protective response, we make use of the PMT. Some researchers have integrated the PMT with the Trans-theoretical model (TTM) to investigate differences between individuals at various stages of preparedness (Martin et al., 2007; Gebrehiwot and van der Veen, 2015). As we investigate only one specific hazard reduction measure, instead of a general stage of preparedness, the PMT-TTM combination is not relevant for our research.

³ The concept of self-efficacy is related to the concept of locus-of-control (LoC), but differs from the latter in that it directly refers to a specific behavioural capability (Smith, 1989). It is also very similar to the concept of 'perceived behavioural control' used in the Theory of Planned Behaviour (Ajzen, 1991) and 'sense of power' in Lin et al. (2007).

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