



Flooding in The Netherlands: How people's interpretation of personal, social and institutional resources influence flooding preparedness



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ABSTRACT

Worldwide there is a growing need for citizens to prepare for environmental risks to mitigate potential adversity. In order to predict preparedness, behavioral models typically used variables at an individual level of analysis, such as risk perception and assessment of the effectiveness of possible actions (response-efficacy). The present study elaborated on these findings by also incorporating affect and social (participation and community efficacy) and institutional (trust and empowerment) level variables. The goal of the research was to examine to what extent these different variables could predict flood preparedness of 629 Dutch citizens resident in The Hague (an area below sea level). The results showed that affect had both a direct and an indirect effect on level of preparedness. The indirect pathway was mediated by people's assessment of the probability of a future event. This supports the notion that preparatory behavior is influenced by both a cognitive and an affective route. At the social level, a direct effect for participation was found: the more residents participated in their community the more they prepared. At the institutional level, the influence of empowerment on preparedness was mediated by participation. Overall, the results point to the need to address both cognition and affect in communicating risks and to make better use of social networks in facilitating citizen preparedness for hazards.

1. Introduction

Citizens generally respond quite adaptively to crisis situations: they take reasonable decisions and select the actions that are needed for the situation at hand [1,2]. However, even though there is mostly no panic or irresponsible behavior, the quality of the actions is clearly bound by knowledge and abilities. After the 2007 Hebei Spirit oil spill in South Korea, for example, many people suffered from skin diseases. These people were not aware of the toxicity and harmful effects of petroleum, and had consequently not taken any precautionary actions [3]. This example illustrates how adaptive capacity can be improved through better preparations. However, even though many countries actively encourage their citizens to prepare for disaster, the results of those efforts are quite discouraging [4]. This identifies a need to understand why some people prepare, while others, even when facing and acknowledging their risk, do not.

The most predictive factor for precautionary actions is whether people have already experienced a disaster [5,6]. However, as few citizens have actually experienced one, it is important to focus attention on how to motivate people to prepare for potential threats in a context

of infrequent hazard events that can occur with little or no warning. In The Netherlands for example, while flooding is a prominent risk, citizens are poorly prepared to deal with the consequences of flood hazards [7,8]. More insight is therefore needed into the psychological mechanisms underlying preparatory behavior to effectively apply interventions to motivate citizens to prepare [9]. Such insights are typically sought using behavioral models. These models have played prominent roles in preparedness because they focus on identifying how people make choices under conditions of uncertainty, such as those that prevail when dealing with unknown natural hazards.

1.1. Behavioral models

Several behavioral models, such as the Protective Action Decision Model (PADM) and the Protective Motivation Theory (PMT), have been used to predict flood disaster preparedness, [10,11]. These theories have demonstrated how individual-level factors, such as risk appraisal, previous experiences, self-efficacy and response-efficacy can contribute to predicting both people's intentions to prepare and actual preparedness prior to the occurrence of disaster. While it has received less

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attention than other variables, there is evidence to indicate that precautionary behavior is also influenced by affect [12,13]. Siegrist and Gutscher [14], for example, suggested that the negative feelings related to previous experiences with flooding directly affects preparations [15]. Given that most preparedness actions occur prior to actual events, the question is whether affect plays a comparable role in circumstances in which people have not had hazard experiences.

Affect is a general concept and defined as ‘positive and negative evaluations of an object, behavior, or idea with intensity and activity dimensions’ [16]. Slovic and his colleagues suggest that affect reveals preferences: a positive affect signals a positive valuation of a situation or concept and the other way around, a negative affect a negative valuation [17]. As such, affect can be used as a heuristic: a particular feeling may act as a driver for performing a certain kind of action or not [17]. Loewenstein, et al. [18] argue that risk perception emanates from both a cognitive path and an affective path. This view was reiterated by Terpstra [19] who stated on the basis of his study that flood preparedness of Dutch residents is guided by an affective and by a cognitive path. Both paths can operate in parallel and have distinct influences on behavior (an individual may, for example, know that a particular risk is low, but still feel anxiety or fear about that risk at the same time).

Affect can also interact with cognitive processes to influence whether people prepare for natural hazards. Paton et al. [13] found that anxiety (about a hazard) could both increase and decrease the likelihood that people would adopt precautionary measures. An important influence on whether people prepared or not, was determined by the mediating role of outcome expectancy (also known as response efficacy). If the anxiety-preparedness relationship was mediated by a belief that it was possible to adopt (personal/ household) protective actions to mitigate the risk posed by a natural hazard, anxiety acted to increase the likelihood of preparedness. So, for hazards such as a coastal flooding in The Netherlands, we predict that both cognitive and affective factors influence preparedness.

The choice of variables used to inform how hazardous circumstances are interpreted should accommodate the degree of uncertainty in the decision-making context. In addition to the variables described above, the assessment of environmental risk is also influenced by others’ views, as are the choices people make regarding how they might confront risks [20,21]. This introduces a need to consider how people’s perceptions of the quality of their social relationships influence their interpretation of risk and what they might do to manage it.

1.2. Social level influences on risk interpretation and action

When seeking to understand preparedness actions, it is important to accommodate social influences on how the risk associated with infrequent and potentially challenging events is perceived and interpreted and how this informs what people do to deal with it [20]. The emotional connections that develop between both the members of the neighborhood (e.g., sense of community) and between them and the place itself (place attachment) increases the likelihood of hazard preparedness [22–25]. Wood, et al. [24] showed that the strongest motivator to take preparedness actions is when individuals share what they have done to prepare with others. Similarly, Paton and Buergelt [23] illustrated how discussions about hazards provided information on how to mitigate certain risks. In all, these studies suggest that exploring preparedness needs a theory that integrates variables at various levels, individual and social, and includes both cognition and emotions. The theory selected to provide the foundation for the work discussed in this paper is the Community Engagement Theory (CET) [20,26].

1.3. Community Engagement Theory: individual, social and institutional level

In his Community Engagement Theory (CET) Paton [20,26]

integrates variables at three different system levels: individual, social and institutional. Analyses of the CET demonstrated that the more people believe that personal actions can mitigate risk (*outcome expectancy*), the more citizens can collectively formulate their risk management needs and strategies under conditions of uncertainty (*community participation* and *collective efficacy*). Further, the more they perceive their needs as having been met through their relationship with civic agencies (*empowerment*), the more likely people are to trust civic agencies and the information they provide and use it to make readiness decisions. Trust, it is argued, plays a key role in how people make decisions under conditions of uncertainty. Trust has similarly been implicated in studies of flooding preparedness. Terpstra [19] discussed how trust affected both dread (an affective influence comparable to anxiety) and perceived likelihood, with these variables having an indirect effect on preparedness.

1.4. Present study

Previous research indicates that people underestimate the likelihood of low-probability risks [14,27]. To motivate citizens to take precautionary actions, more insight into the mechanisms underlying this behavior is needed. In the present study, we used the Community Engagement Theory [26] as a starting point for measuring underlying constructs. The way in which the theory was adapted is discussed in more detail below.

Consistent with previous studies in the Dutch context [7,8,19], this study added risk perception (including affect) in addition to the variables included in previous studies with CET. Based on work that preceded the development of the CET, it was hypothesized that risk perception would have a direct influence on preparedness [13].

For affect it was hypothesized that, given the action of the ‘affect heuristic’ [17,18], it would have a direct influence on preparedness. In addition an indirect effect is hypothesized such that response efficacy mediates the relationship between affect and preparedness [13].

2. Methods

2.1. Respondents and procedure

Respondents were recruited through a panel that is managed by a professional agency commissioned by the municipality of The Hague. The city of The Hague borders the North Sea and as it is below sea level, consequences will be severe in case of a coastal flooding. The total panel consists of 6000 respondents. The characteristics of the panel are as follows: 1) gender: 54% male, 46% female; 2) age: 15–24, 1%, 25–44, 31%, 45–64, 46%, > 65 22%; 3) education: low 12%, middle 25%, high 63%; 4) cultural background: 1) native 70%, foreign 30%. A random sample of 1200 respondents was drawn from this data base. They were all invited to participate. As 629 persons agreed to participate the response rate was 52%.

The mean age of the respondents was 58 years (sd = 13 years), 370 men (59%) and 259 women (41%). Most of the respondents had a higher education level (N = 363, 58%), 179 (29%) had a mean level of education and 78 (12%) respondents a low level. Most of the respondents were employed (59%): 309 were salaried workers (49%), 60 (10%) were businessmen, 180 (29%) were retired and 48 (8%) were unemployed or disabled. 555 individuals (88%) were native and 62 (10%) were foreign.

2.2. Material

We translated the survey used by Paton [26], adjusted it to the Dutch culture (which mainly concerned items at social level as most Dutch communities do not have evident community leaders) and added risk perception (probability, consequences and affect). Together with the original constructs in the Paton survey, response-efficacy (positive

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