

Psychological factors affecting flood coping strategies

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Abstract

There is an acknowledged need to improve the resilience of those at risk of flooding in areas of the UK. Studies of disaster preparedness worldwide indicate raising awareness of a hazard does not necessarily engender action. In the UK the majority of the at-risk population do not display adaptation behaviours until they have experienced one or more flood events, a finding not adequately explained by levels of information provision or financial pressures. An appreciation of the psychological underpinning of current behaviour patterns, including decision-making processes, can illuminate our understanding of the strategies employed. A review of relevant psychological theories affecting adaptation behaviours in a variety of hazard situations is presented. Findings reveal the influence of belief systems, such as locus of control and self-efficacy, on decision-making in risk environments: statistically significant correlations have been noted between the types of hazard-behaviours displayed and the scores obtained on the relevant belief system metrics. It is suggested psychometric measures might be employed as capability indicators and adoption of such techniques may contribute to improved resilience in the future.

Keywords: flood, resilience, psychology, preparedness, adaptation, capability.

1 Introduction

In the context of anticipated climate change [1], the UK government has enacted legislation in the form of the Climate Change Act [2]: increasingly worldwide attention is focussed upon assessing vulnerability to extreme events, improving

upon recovery plans to deal with their aftermath and examining the ways in which adaptation to climate change might enhance resilience in the future. The overall picture is, however, a very complex one: the interactions between human society and the physical environment, whether natural or man-made, are open to interpretation from many different disciplines, and an accepted comprehensive model, integrating inputs from the physical sciences, engineering, socio-economic and organisational aspects, has yet to be formulated [3]. The issue of differential vulnerability illustrates this point, in that all the people who reside in a particular hazard zone are not necessarily equally vulnerable to event impacts [4], not only for reasons of socio-economic disadvantage, but also their ability to cope with post-event factors, such as psychological trauma. A full understanding of the ways in which people respond to hazard information cannot, therefore, be based solely upon a geographically bounded concept of what constitutes a 'community': the behaviour patterns and motivations of individuals making up that community must be considered [5] along with the ways in which behavioural changes can be elicited. To explore this topic more fully, we will now look at flood-related issues within the UK.

1.1 Awareness raising

Campaigns intended to promote protective behaviours via awareness-raising have been widely used, but may not always be as successful as the policy-making bodies would hope or expect: an annual campaign on flood-risk within England and Wales has been in place since 2001, but it has been found that only 60% of at-risk residents claimed to be aware they lived in a flood risk area [6]. Similarly, a free telephone flood warning system for at-risk properties has been available throughout this period, but at the time of the summer 2007 flood events, only 41% of eligible homes were registered for the Floodline Warnings Direct service [7]. Such behaviour patterns are not unique to the UK, nor are they peculiar to flood risk, as the literature on natural hazards worldwide will reveal [8–11]. The consistency of these findings (that awareness does not engender action) suggests that, in order to change human behaviour patterns, a more sophisticated approach may be required: this is discussed by Fischhoff [12] in the context of risk communication strategies, in relation to a variety of hazards, over a twenty year period. If it is, therefore, accepted that appeals and advice predicated on rationality are insufficient in themselves, an examination of the psychological theories covering decision-making and behaviour change may offer a way forward in promoting resilient adaptation.

2 Psychological theories of decision-making

In the second half of the 20th century, psychologists initially viewed decision-making as being a predominantly rational process, involving logic, reason and consideration of all possible risks and benefits associated with a particular decision [13]. This 'rational actor paradigm' would, however, be an extremely time-consuming strategy, if employed afresh for each decision that human beings

must undertake. It was, therefore, suggested that instead human beings commonly employ mental short-cuts, based upon experience, such as 'heuristics' to arrive at solutions swiftly [14]. Thus, when asked to estimate the probability of an event occurring, a person might employ the 'availability heuristic': they will make use of the associations most available, in that they can be brought to mind readily. Aircraft crashes, though in fact comparatively rare occurrences are easily brought to mind because they receive so much media exposure and are, therefore, thought to be more common than they really are. An alternative view [15] suggests human beings make use of 'fast and frugal' algorithms to make probabilistic judgements; for instance, memory is searched for cues to the problem and the first cue that is diagnostic will be adopted as the solution. Although such algorithms neither look up nor integrate all available information, empirical data [15] indicate that these strategies match, or outperform, all competitors in inferential speed and accuracy. As with heuristics, such mechanisms would provide a more time-efficient method of arriving at a conclusion, consistent with the cognitive limitations of human decision-makers.

3 Decision-making in risk environments

Although the above models can offer coherent explanations for many individual decision processes, and indeed some social choice situations, more complex mechanisms seem to pertain to human behaviour under conditions of uncertainty such as disaster preparedness. The 'psychometric paradigm', incorporating the heuristics argument, is a theoretical framework developed by Slovic and others over two decades [16, 17]. This assumes risk is fundamentally subjective, and defined by individuals in accord with the influence of psychological, social, institutional and cultural factors. In respect of natural hazards, the 'affect heuristic' was identified as an important factor: this short-cut makes use of the feelings associated with a given stimulus, for example liking the subject (positive affect) or disliking it (negative affect) [18]; this might colloquially be termed the 'gut reaction' to a situation.

The relationships between perceived risk, perceived benefit and risk acceptance are complex, but another consistent finding has been that, where perceived benefits are deemed to be high, the associated risks will be perceived as low and vice versa. This inverse correlation principle is harnessed by, notably, the advertising industry: product campaigns tend to emphasise the *benefits* of the goods or services offered, perhaps employing emotional content in order to do so; a health promotion campaign, however, is more likely to highlight the *risks* of a given behaviour, with the intention of deterrence or discouragement. A causal relationship here has been demonstrated [19], but careful consideration of behavioural theory is required, in order to identify the critical beliefs underlying the intentions of the target population if campaign materials are to be effective [20].

Another psychological theory of relevance here is prospect theory [21] which considers the importance of the 'framing' of problems, such as whether the result of a gamble will be a gain, or a loss, relative to the reference point of the current

state. Expressing outcomes in terms of financial costs and benefits clearly resonates with the behaviour of residents in flood-risk areas, when they are considering investment in property-level resilience measures. Such decisions may also have timing implications: a dilemma can be seen to exist between short-term expenditure and long-term potential savings, and different groups of people will make different choices in the same situation. This issue may also be viewed in the context of motivational priorities [22]: it is in accordance with a rationality model that immediate and pressing needs would be addressed in preference to longer-term needs, especially if the latter are uncertain.

4 Social factors in decision-making

As social animals, our decision-making processes are influenced by the societies in which we live; there is the option to act as an individual, or to conform to a group norm. For example, a householder may wish to buy and install flood resilient products, in order to protect their own property; however, a dilemma can arise if s/he is aware this approach could attract opprobrium, from neighbours who believe advertising the existence of a flooding problem will affect the saleability of their own homes [23]. The ability to withstand social pressures, such as this, will vary between individuals, and indeed groups of people, bringing personality factors into the, already complex, problem. Other socio-cultural values, beliefs or superstitions exert effects on different sectors of the at-risk population [24–26].

The scope for misunderstandings in relation to flood risk has been well documented: for example, the misapprehension that dams actually built for hydro-electricity generation were flood-control structures [27]. A cultural example was noted in relation to the Easter 1998 flood event in Banbury, wherein some recent immigrants to the UK expressed surprise, as they had not expected to be flooded in a developed country [28]. Such belief systems, therefore, pose an additional contributory factor in decisions relating to flood risk adaptation. It has been noted that floodplain populations tend to ignore flood risk until either regulation, or repeated flood events, brings about behavioural changes [29]. A motivational mechanism for this phenomenon has been suggested: people without flood experience envisaged the consequences of a flood differently from people who had actually experienced severe flood losses [30]. In psychological terms, therefore, they underestimated the ‘negative affect’ associated with a flood: this has obvious implications for communication of warning campaigns across natural hazard scenarios, in that the potential for negative emotional consequences should be incorporated into educational materials, as well as information on mitigating tangible losses.

5 Measuring beliefs

Belief systems (a term that is not limited to religious beliefs in the present context) can have strong influences on decision-making processes; this applies not only in hazard adaptation contexts, but also in fields such as health,

education and occupational psychology. Such beliefs may pose a barrier to action, even where awareness of hazard and knowledge of possible mitigation strategies both exist. Constructs offering explanations for belief-driven behaviours have been developed, as have techniques to measure these constructs; those used most widely in natural hazard studies will now be outlined.

5.1 Locus of control

This construct is derived from Rotter's Social Learning Theory [31]: where experience leads an individual to believe s/he is responsible for the outcomes of their actions, that person tends to develop an 'internal locus of control'. If forces external to the individual are perceived to be responsible for outcomes, however, the learning process is likely to result in the development of an 'external locus of control'. The Internal/External score (hereafter I/E) is typically measured via a forced choice expression of belief in a list of statements, such as:

- a. *Many of the unhappy things in people's lives are partly due to bad luck.*
- b. *People's misfortunes result from the mistakes they make.*

In an educational context, it has been found having an internal locus of control contributed to the educational attainment of US teenagers, operating via their expectations of the return on 'investment' represented by completing high school [32]. In studies of natural hazard behaviours, statistically significant correlations between behaviours and I/E scores were found in the context of earthquake preparedness [33]. It should be noted the locus of control orientation provides a measure of cross-situational beliefs, or *generalised* control beliefs, contrasting with the next concept to be examined

5.2 Self-efficacy

This concept refers to an individual's convictions (or confidence) about his or her abilities to mobilize the motivation, cognitive resources, and courses of action needed to successfully execute a *specific* task, as opposed to the more generalized locus of control scale discussed above. Self-efficacy, measured by means of a psychometric scale, has been utilised in human performance studies: employees who perceive themselves as highly efficacious will display a strong sense of commitment to their activities and, if these are well executed, produce successful outcomes; those who perceive their self-efficacy to be weaker will tend to lose confidence in their personal abilities and fail at set tasks [34].

5.3 Strength of belief

An additional characteristic of studies on adaptation to climate change is the inherent uncertainty around both the causes and, for some individuals and groups, doubt as to the existence of the problem itself. This is in direct contrast to models deriving from studies in the health sphere, where issues such as disease diagnosis are self-evidently real. The roles of strength of belief in climate

change itself, and strength of belief in personal adaptive capacity, have been examined in the context of adaptations to forestry management in Sweden [35]. A significant positive association between the first characteristic and adaptation actions was identified, as was a significant association between lack of such belief and motivation for *not* adapting. They conclude the pre-requisites for positive adaptation were strong beliefs in the hazard itself, and the belief that, as an individual, a person has the power to do something about the hazard.

6 Next steps – is it possible to predict capability?

Many metrics of resilience have been identified (e.g. demographics; health and wellness; quality of life) but the majority of these apply at the community, rather than the individual level [36]. Such factors, therefore, can provide an overall indication of resilience in a geographically-bounded community; this is useful in monitoring the effects of a given intervention, but does not advance our understanding of how optimal interventions might be formulated and applied. Examination of factors affecting the individuals within a community may offer a more appropriate route for this; however, although suitable techniques exist for measuring such constructs, many of the conceptual models currently in existence are derived from the field of health studies. Such models may not be entirely appropriate when considering behaviours relating to climate change adaptations: for example, these lack the ‘strength of belief’ element discussed earlier. Utilising a suitable hazard-preparedness model can advance our understanding of the relevant behavioural factors at play in this specific context; such an approach offers the potential to predict community capability, based on the psychometric profile of the individuals within the group and some specific examples will now be considered.

In respect of disaster warning responses, consistent correlations have been noted between internal locus of control scores and behaviour; warnings need to be heard, believed, personalised and acted upon in order to be effective, and these behaviours are more likely to be found in internally, rather than externally, oriented people [37]. An investigation of disaster preparedness relating to hurricanes in the US, found the most important predictors of preparation behaviours were age, prior experience of a hurricane and locus of control score [38]. The self-efficacy construct has also been found to be of value in disaster resilience contexts: for example, it has been found that low self-efficacy scores equated to a feeling of being ‘not competent to act’ and, thus, the risks (in this case volcanic hazard effects) were perceived as insurmountable [8].

A German study of pro-environmental behaviour, using a model incorporating ‘perceived behavioural control’ (which includes a measure of self-efficacy) found this variable to be amongst the most powerful predictors of intention to act, explaining 52% of the intention construct [39]. Another German study makes use of a ‘process model of private proactive adaptation to climate change’ (MPPACC) [40]; this incorporates both self-efficacy and a factor termed ‘fatalism’, closely resembling an aspect of high externality, as key variables in the formation of adaptation intention within the individual. A subsequent

modification to the model, specific to precautionary flood prevention in Germany, included the additional factor of 'threat experience appraisal', but this version omitted the impact of social discourse regarding climate change that had appeared in the earlier model [41]. It must be noted that cultural variations can impact upon the results of such studies; hence, findings from one nation's residents may not necessarily be replicated in other flood-risk populations [42]. An Australian model, originally formulated to account for Tsunami preparation behaviours, has been found to be applicable across other hazard environments [43], although the type of fluvial and coastal flooding typically found in the UK was not included. This model does, however, incorporate the concept of 'trust' as a mediating factor in the formation of intention, a variable not appearing in those discussed previously. It may, therefore, be argued that formulation of a model suitable for use with the flood-risk population of the UK is overdue.

7 Summary

This review has examined the psychological factors found to be of relevance in disaster preparedness, including the flood risk context. Drawing upon both decision-making theory and belief system constructs, the theories underpinning some current behavioural models have been described. The particular constraints operating in climate change related studies are found not to be reflected in those models derived from the health study field in the UK, whilst models predicated on climate change from Germany and Australia have not been tested within a UK flood-risk population. Further work to develop and test a model specific to flood preparedness behaviours in the UK is therefore required.

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