

Residents' perceptions of coastal flood risk and its management through Coastal Defence Strategies at Emsworth, United Kingdom.

*Edward C. R. Shackleton, Department of Geography, University of Portsmouth, UK,
edward.shackleton@myport.ac.uk*

Jonathan Potts, Department of Geography, University of Portsmouth, UK, jonathan.potts@port.ac.uk

David Carter, Department of Geography, University of Portsmouth, UK, david.carter@port.ac.uk

*Rhoda Ballinger, School of Earth and Ocean Sciences, Cardiff University, UK,
ballingerRC@cardiff.ac.uk*

Abstract

Residents' perceptions of coastal flood risk and its management at Emsworth, United Kingdom have been analysed using a mail survey. Research findings indicate an apparent complacency of attitudes such as "I am safe" and "I can cope" with flooding. The need for more effective, simpler communication along with more publicity from Operating Authorities regarding coastal flood risk was apparent.

1.1 Introduction

Throughout Europe flood hazards present one of the greatest challenges to coastal management. In England and Wales some five million people live and work in properties at risk of flooding from rivers or the sea (Potts, Carter & Taussik, 2005). Particularly, in light of climate change predictions, there is a requirement for this risk to be managed (and the vulnerability of communities reduced) so that the coastal zone can be developed sustainably.

Flood risk assessment goes beyond meteorological events, hydrological regimes, flood hazards mapping and technical means. It includes awareness and engagement of communities 'at risk' and an associated understanding of how the general public and decision makers perceive 'risk', a topic which, as yet has not attracted much research effort. Wheather (2006, p.2144) notes "It is argued that public perception of risk is not yet adequate and that much work is needed to raise awareness and preparedness for action in the event of such occurrences". This is unacceptable if coastal flood hazard vulnerability is to be reduced and mitigation increased.

In England and Wales, a hierarchal three tiered structure now operates to provide a better balance between economic, social and environmental development in managing coastal risk" (Defra, 2006, p.1). This includes Shoreline Management Plans (SMPs), Coastal Flood and Erosion Risk Management Strategies (CFERMSs) and individual projects.

CFERMSs, long-term frameworks for managing coastal flooding, are prepared under national guidance for defined, coherent stretches of coast in England and Wales. For each strategy a consultation process aims to facilitate understanding of decision-making and proposed actions amongst stakeholders and the wider community. This includes a defence strategy option appraisal of 'Do nothing – no active intervention' (Let nature take its course – no further maintenance or repair work is undertaken except to manage health and safety at the site, allowing existing defences to deteriorate over time); 'Do minimum' (Maintain existing defences until they fail and then revert to no active intervention); 'Hold the line- active

intervention with three sub options' (Maintain – defences are maintained at their current levels, but as sea levels rise flood risk increases over time) (Sustain – defences are raised and strengthened as sea levels rise keeping the level of flood risk the same as it is now) (Improve – defences are improved to reduce flood and erosion risk); 'Managed realignment' (Improve coastal stability by moving coastal defences to a more sustainable location further inland, allowing controlled flooding to occur) (Environment Agency, 2009). Flood risk maps are also present within the CFERMS.

This study examined residents' perceptions of coastal flood risk and its effective management through a CFERMS at Emsworth, United Kingdom, where CFERMS plans are unlikely to receive national funding, increasing future coastal flood risk. As such, this provides a useful case study for coastal managers in other European Member States who need to engage effectively with local communities, particularly in areas where traditional 'hold the line' type approaches may no longer be sustainable in the long-term.

2.1 Literature review

The number of people vulnerable to coastal flooding is predicted to increase dramatically as extreme events for coastal systems, such as tides, waves, storm surges and storms affected by regional climate change (Bijlsma, 1997).

The term perception applies to the mental process through which a person takes in, deals with and assesses information from the environment via the senses. Therefore, perception will be influenced by multiple factors as both the perceived physical threat posed by a hazard and society's actions influence individual perception and ultimately behaviour. However, people are largely overoptimistic with regard to personal risk they face (Sjoberg, 1998).

In England the British Market Research Bureau (2003) found that 41% of people are unaware of their flood risk. This is supported by findings from the COMRISK project where two-thirds thought the risk of coastal flooding was low or very low (Kaiser & Witzki, 2004). Myatt-Bell, Scrimshaw and Lester (2003a) also found that 51% of respondents agreed that past flooding was a freak event and is unlikely to happen again despite 74% indicating that coastal flooding is likely if flood defences are not maintained.

Research has shown that an ignorance of risk is not the prime factor resulting in vulnerability and that a willingness to gamble is prominent within at risk communities (Pottier, Penning-Rowsell, Tunstall & Hubert, 2005), as people's expectations of their ability to cope with flooding appears fairly high although somewhat optimistic (Green, Tunstall & Fordham, 1991).

Decision makers should take account of public perception and facilitate the exchange of information with the community, as willingness to accept and trust information and act to mitigate risk will increase (Renn, 2004). However, Green et al (1991) found that different groups within the population choose different risks from flooding as their focus of concern.

Since 1998 the Environment Agency in England and Wales have operated a flood warning centre and since 1999 has undertaken flood risk campaigns, with the primary purpose of increasing risk knowledge of those living in flood risk areas to minimise damage and vulnerability should a flood occur (Pottier et al., 2005; Johnson, Penning-Rowsell & Parker, 2007). Aiming for 80% provision of flood warning for those at risk, the Environment Agency has also developed more graphic flood warning codes, a flood forecasting system, and a

new opt-in 24hour Floodline telephone centre with multi-language and multi-disability facilities (Johnson et al., 2007). By 2000 0.5% annual probability flood maps were provided for all areas of coastal flooding (Pottier et al., 2005). Despite this provision, awareness of living in a flood risk area has not greatly improved with many residents still unaware of the risk (Wheater, 2006).

The appropriateness of the information supplied must also be considered as “we cannot assume that an intelligent person can understand the meaning of and properly act on even the simplest of numbers, not to mention more esoteric measures or statistics pertaining to risk, unless these numbers are influenced with affect” (Slovic, Finucane, Peters & MacGregor, 2004, p.321). Krasovskaia et al (2001) concluded that flood risk must be communicated better, as the perception of flood hazards by the general public is not realistic. However, care must be taken regarding assumptions that the provision of information on hazards or risk will facilitate the adoption of preventative measures, as it is how people interpret the information in the context of experiences, beliefs and expectations, not the information itself that will cause them to take action (Paton & Johnston, 2001).

Risk communication must take place regularly to maintain preparedness over time and should be coupled with information informing residents of how to reduce or prevent damage (Siegrist & Gutscher, 2006).

3.1 Background to the Study Site

Emsworth, a small town of about 10,000 people occupying a coastal stretch of land around Chichester Harbour situated on the border between Hampshire and West Sussex along the central south coast, was selected as a suitable case study location as the CFERMS identified a need for defences whilst also stating funding would be unlikely (Fig. 1.). In Emsworth in 2008 194 properties were at risk of flooding from a 0.5% annual probability event increasing to 389 properties within the next 100 years with a one meter increase in sea level if defences are not maintained (Environment Agency, 2009a). This flood risk is present due to the low lying topography of the coastal fringe combined with the flashy regime of the river Ems. The low level of embankment around the Mill Pond provides the lowest level of protection to the Emsworth area. At its lowest level of 2.91mODN the Mill Pond would be overtopped by either combination of 100 year fluvial event and 1 year water level or a 1 year fluvial event and 100 year water level (HR Wallingford, 2004).

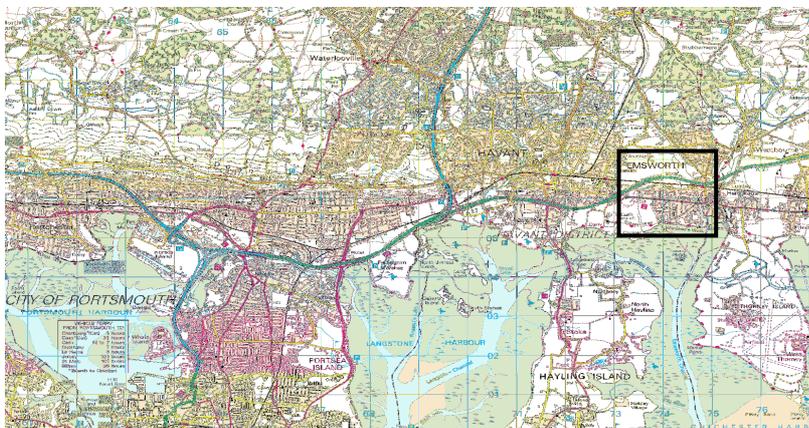


Figure 1. EDINA Digimaps of the study area

4.1 Methodology

A mail questionnaire conducted in July 2009 examined residents' perceptions of coastal flood risk and proposals for its management within Coastal Defence Strategies at Emsworth. 150 addresses were randomly selected along roads identified as being at flood risk within the CFERMSs flood map indicating 0.5% annual probability flood events in 2008 and 2108 with a one meter of sea level rise. The surveys were then hand delivered to these addresses. The questionnaire consisted mainly of closed questions using a 5 point Likert scale to assess the public perception and understanding of the CFERMS. However, open ended questions were also included to allow residents to answer in their own terms or to provide more detail.

5.1 Analysis

5.1.1 Perceived Risk

A response rate of 42.7%, 18.7% and 10.7% higher than similar research (Myatt-Bell et al., 2003a; Myatt-Bell, Scrimshaw, & Lester, 2003b), indicates an effective questionnaire design. 46.8% of the respondents identified that they had experienced flooding from the sea with 14.1% indicating that their own house or garden had flooded.

There was a high level of recognition of the risk of coastal flooding as only 13.3% of residents disagreed or strongly disagreed that there was a risk of coastal flooding at Emsworth. This is substantially higher than previous research within England that found 41% of people are unaware of their flood risk (British Market Research Bureau, 2003). These findings also disagree with Wheater (2006) as the vast majority of residents are aware of their flood risk, or at least that some level of risk is present. However, 39.3% of residents believed that this flooding had been caused by freak extreme events. This shows a similar level of perception to Myatt-Bell et al (2003a) who recorded that 51% of respondents agreed that past flooding was a freak event and would not happen again for a managed realignment site at Orplands, Essex. This identifies how respondents view a flood as an unusual freak event, therefore are less likely to prepare for something with a low perceived chance of occurrence. Only 22.2% of respondents perceived that they would not be able to cope with a flood event. This supports the view that people's expectations of their ability to cope with flooding also appears fairly high, although somewhat optimistic (Green et al., 1991).

Perception of an increased risk of coastal flooding due to climate change appeared high, with only 13.6% of people disagreeing and no respondent strongly disagreeing that climate change has increased the flood risk. This opposes previous findings by Whitmarsh (2008) that climate change is perceived to be a future and distant problem.

5.1.2 Understanding of Risk Exposure

Of the respondents 29.5% were unaware of flood maps for the area indicating that flood risk awareness activities undertaken by the Environment Agency and CFERMS documents require a higher level of publicity as community awareness of the at risk population could be improved.

With a decreasing return period of flooding the average concern increased. Lower average levels of concern were shown by males and higher levels of concern by younger residents for decreasing return period of flooding. This supports research showing that fear of hazards is

not equally distributed across the population with women feeling more threatened however, the research does not support other findings that young people will have greater fear of hazards than the elderly (Krasovskaia et al., 2001). Less than 50% of residents did not disagree or strongly disagree that a flood event that happens every 200 or 100 years does not concern them. This suggests that half of the at risk population are not concerned by the levels of flooding indicated on Environment Agency coastal flood maps and within the CFERMS. This could lead to low levels of interest in flood risk management maps that only portray 200 and 100 year flood risks zones.

The high level of awareness of coastal flooding at the case study location, coupled with moderate levels of concern for events occurring more infrequently, supports Pottier et al's (2005) findings that an ignorance of risk is not the prime factor, as a willingness to gamble is prominent within flood plain residents.

Respondents showed a high level of understanding of some elements of the probabilistic explanation of flood risk within the CFERMS. For example most (80%) realised that if a 1 in 200 year flood event occurs this year, then next year the 1 in 200 year event could still reoccur. Despite this understanding only 50% of residents correctly identified that a flood event with a 0.5% annual probability is predicted to occur once every two hundred years. This question was specifically designed to test respondents understanding of the meaning behind the 0.5% annual flood probability as this appears in the CFERMS. This poor understanding is strongly supported by Slovic et al (2004, p.321) "we cannot assume that an intelligent person can understand the meaning of and properly act on even the simplest of numbers, not to mention more esoteric measures or statistics pertaining to risk, unless these numbers are influenced with affect".

Only 19.7% of residents were aware of the CFERMS. But, once aware 66.7% had gone on to read at least one part of the document indicating that greater resources should be put into raising awareness of the CFERMS's existence due to the high level of interest once aware. Less than 10% of flood risk respondents were aware of both the SMP and CFERMS. Respondents who had read the CFERMS failed to show an increase in accuracy of identifying the correct meaning behind a 0.5% flood probability.

5.1.3 Acquisition of Information

One third of respondents had attended a 'find out more' public meeting on the CFERMS but no respondents had replied to the publication of the CFERMS despite these being requested by the Environment Agency. Despite 72.7% of respondents indicating that they supported the coastal defence strategy only 41.7% successfully identified the correct policy option of 'Hold the Line, Improve'. 66.7% of respondents did identify one of the three 'Hold the Line' options of 'Maintain, Sustain or Improve'. 77.2% of respondents thought that the required funds were unlikely to be secured indicating that future breaching of defences should be less of a surprise and people may be more willing to start thinking about alternative measures of risk mitigation.

There is a high level of interest in being involved in the CFERMS as indicated by 59.7% of respondents. These results are similar to those found by Myatt-Bell et al (2003a), where 69% of respondents identified an interest, but are much higher than those reported in the COMRISK project (30%) (Kaiser & Witzki, 2004). However, 79.7% of respondents indicated that they were unaware of how to represent their opinion if they did not agree with the

CFERMS. These findings are slightly higher but in general agreement with the COMRISK project that found 70% of respondents were unaware of how to represent their opinion (Kaiser & Witzki, 2004). This could lead to feelings of abandonment if residents do not feel they have been protected.

This research identifies how attempts to manage coastal defence and flooding generates high levels of interest within English coastal communities. However, only 5.4% of respondents identified the public meeting as being their preferred method of communication. Indicates that the 'Find out more' public meetings were generally not seen as a desirable format for the 'at risk' community. By far the most popular was an information booklet / newsletter with 67.9% of the population preferring this communication approach.

Residents recall of receiving information about the flood risk was low at 37.1%. This indicates that the public awareness campaigns undertaken by the Environment Agency (Pottier et al., 2005; Johnson et al., 2007) would seem to have failed to inform the majority of Emsworth's at risk residents. However, as it is widely recognised that risk communication needs to take place regularly, this low response rate might also indicate a significant time gap between reassertions of the flood risk message at Emsworth.

6.1 Recommendations and Critique

Whilst there are some issues associated with this one-off survey, the results point to some interesting findings, and potential recommendations of relevance not only to the local coastal managers, but to others' involved in trying to promote community engagement in coastal risk. These are briefly outlined below.

In terms of issues, these can be summarised as those associated with the timing and potential bias of the survey. For example, it is expected that if this survey had been completed in the winter, when coastal flooding was more likely, different levels of perception and concern may have been recorded. Additionally, the results could be biased as households with a higher interest in the survey would have been more willing to return the questionnaire causing an apparently increased awareness of coastal flood risk issues.

The key recommendations emanating from this survey include those which relate to style and format of the information used to communicate coastal risk. In summary, it is recommended that the CFERMSs should take more account of how different groups in society identify and understand flood risk. Such terms as '0.5% annual probability event' were poorly understood, with many people unable to understand probabilistic statements. The keys to maps within the CFERMSs therefore need to be simplified, explaining the risk level shown in more basic terms.

Most people were aware of the flood risk but were prepared to gamble, showing low levels of concern for more infrequent events. Interaction with information provided could be increased if more frequent flood events were also shown potentially leading to further information seeking. This would have the effect of reducing the gambler's odds and induce a higher level of concern, potentially resulting in more interest in flood prevention measures. A greater consideration of residents' perceptions should, therefore, be made when writing the CFERMSs, in order to gain higher levels of interest and a common ground to start building knowledge within the community.

Once aware of the CFERMS 66.7% of respondents had gone on to read the document, thus indicating a high level of interest, once 'bitten'. Therefore, it is suggested that more effort should be made to publicise the document within the local community through a variety of advertising mediums.

The CFERMS focus almost entirely on levels of risk with very little information of how to mitigate risk may also represent a missed opportunity, particularly given suggestions elsewhere that risk information should be coupled with advice of how to reduce or prevent damage (Siegrist & Gutscher, 2006). This is significant, given the need to move towards effective climate change adaptation in coastal areas. The CFERMSs provide a vital opportunity to inform about risk mitigation and coastal adaptation alongside justification for decisions related to specific individual defence options. It is, therefore, recommended that greater emphasis and more space within CFERMSs be given to private mitigation and adaptation measures.

7.1 Conclusion

This study has revealed that residents in the Emsworth area had a high awareness of local coastal, flood risk. However, an apparent complacency was revealed by attitudes such as "I am safe" and "I can cope". Concern for flood events occurring less frequently than '1 in 50' years were low, suggesting that the strategies and associated Environment Agency flood risk maps might depict higher probability events to generate more concern. Currently, information presented within related documents, particularly statements indicating flood probability as a percentage (0.5% annual probability) are too technical for the general community.

Despite the significant investment in consultation processes for CFERMSs in recent years, this study reveals the continued, limited awareness of resident populations coastal risk and its management. This suggests the need for more effective, simpler communication along with more publicity from Operating Authorities. It is proposed that these basic measures, relevant to coastal managers elsewhere, may trigger higher levels of interest and understanding within 'at risk' communities. These, in turn, should facilitate greater interest, information seeking and mitigation measures.

References

- Bijlsma, L. (1997). Climate change and the management of coastal resources. *Climate Research*, 9, 47-56.
- British Market Research Bureau. (2003). *Environment Agency launches campaign to tackle flood apathy*. Retrieved August 01, 2009, from the British Market Research Bureau web site: http://www.marketresearchworld.net/index2.php?option=com_content&do_pdf=1&id=327.
- Department for Environment, Food and Rural Affairs. (2006). *Shoreline Management Plan guidance volume 1: aims and requirements*. Retrieved February 24, 2007, from the Department for Environment, Food and Rural Affairs web site: <http://www.defra.gov.uk/enviro/fcd/policy/smpgvol1.pdf>.
- Environment Agency. (2009). *Planning for the future: Portchester Castle to Emsworth draft coastal flood and erosion risk management strategy summary document*. Worthing: Environment Agency.

- Green, C., Tunstall, S., & Fordham, M. (1991) The risk from flooding: which risk and whose perception? *Disasters*, 15(3), 227-236.
- HR Wallingford. (2004). *Flood risk assessment: Emsworth Mill Pond*. Retrieved June 14, 2009, from Havant Borough Council web site: <http://www.havant.gov.uk/PDF/MillPondFRA.pdf>.
- Johnson, C., Penning-Rowsell, E., & Parker, D. (2007). Natural and imposed injustices: the challenges in implementing 'fair' flood risk management policy in England. *Geographical Journal*, 173(4), 374-390.
- Kaiser, G., & Witzki, D. (2004). Public perception of coastal flood defence and participation in coastal flood defence planning. *Geographie der Meere und Kusten Coastal Reports*, 1, 101-108.
- Krasovskaia, I., Gottschalk, L., Saelthun, N., & Berg, H. (2001). Perception of the risk of flooding: the case of the 1995 flood in Norway. *Hydrological Sciences-Journal-des Sciences Hydrologiques*, 46(6), 855-868.
- Myatt-Bell, L., Scrimshaw, M., & Lester, J. (2003a). Public perception and attitudes towards a current managed realignment scheme: Brancaster West Marsh, North Norfolk, U.K. *Journal of Coastal Research*, 19(2), 278-286.
- Myatt-Bell, L., Scrimshaw, M., & Lester, J. (2003b). Public perception and attitudes towards a forthcoming managed realignment scheme: Freiston Shore, Lincolnshire, U.K. *Ocean and Coastal Management*, 46(6-7), 565-582.
- Paton, D., & Johnston, D. (2001). Disasters and communities: vulnerability, resilience and preparedness. *Disaster Prevention and Management*, 10(4), 270-277.
- Pottier, N., Penning-Rowsell, E., Tunstall, S., & Hubert, G. (2005). Land use and flood protection: contrasting approaches and outcomes in France and in England and Wales. *Applied Geography*, 25, 1-27.
- Potts, J.S., Carter, D. and Taussik, J (2005) Shoreline management - the way ahead. In Smith, H.D. and Potts, J.S. (2005) *Managing Britain's Coastal and Marine Environment - towards a sustainable future*. Routledge and the National Maritime Museum. pp 239 - 272.
- Renn, O. (2004). Prediction of risks. *Toxicology Letters*, 149, 405-413.
- Siegrist, M., & Gutscher, H. (2006). Flooding risks: a comparison of lay people's perceptions and expert's assessments in Switzerland. *Risk Analysis*, 26(4), 971-979.
- Sjoberg, L. (1998). Worry and risk perception. *Risk Analysis*, 18(1), 85-93.
- Slovic, P., Fischhoff, B., & Lichtenstein, S. (1982). Why study risk perception. *Risk Analysis*, 2(2), 83-93.
- Wheater, H. (2006). Flood hazard and management: a UK perspective. *Philosophical Transactions of the Royal Society A*, 364, 2135-2145.
- Whitmarsh, L. (2008). Are flood victims more concerned about climate change than other people? The role of direct experience in risk perception and behaviour response. *Journal of Risk Research*, 11(3), 351-374.