



Communication and dissemination of probabilistic flood warnings - literature review

Science Summary SC070060/SS1

The Environment Agency has commissioned research into communicating concepts of risk and uncertainty with flood forecasting and warning messages.

As a key part of this project, consultants reviewed previous research and other relevant sources of information to determine how public and professional partners understand and use information about risk and uncertainty.

The three main areas covered by the literature review were:

- A review of Defra (Department for Environment, Food and Rural Affairs)/Environment Agency flood and coastal erosion risk management literature.
- A review of international material on the communication and dissemination of probabilistic flood warnings.
- A review of literature on how the public and professional partners make sense of information about risk and uncertainty.

What are the main findings?

A review of Defra/Environment Agency flood and coastal erosion risk management literature

This review looked at past research on flood warning communications to establish what personal or cultural factors require consideration in the communication of risk and uncertainty.

Little research was available on the differences between the specific groups involved in this study, but it found that one of the potential benefits of giving probabilistic flood warnings is the possibility of earlier flood warnings.

A range of variables determine the response to a flood warning. The presentation of warning information is only one of these variables, and the way that information is understood and acted upon is often influenced by other variables such as the trust in source of information.

Previous research highlighted the use of unfamiliar technical expressions as unhelpful in communicating risk to members of the public, a factor which should be taken into account in the design of probabilistic warnings or forecasts.

There is a lack of information about the way professional partners use warning information to inform their response to flooding. However, the needs of professional partners will vary according to their scientific background and how they use information. This shows that a 'one size fits all' approach is not likely to be effective.

A review of international material on the communication and dissemination of probabilistic flood warnings

A review of international information was carried out to establish how information about probability is communicated in different countries for different natural hazards. This also looked at different dissemination methods and types of technology used for such communications and the type of language and images used to communicate probability in forecasts.

The review covered a number of different natural hazards such as floods, hurricanes and earthquakes. Methods of communication ranged from messages with qualitative or quantitative probabilities, graphs, icons and maps and a combination of all of the above. Some approaches were more successful than others, however there were few examples of probabilistic or uncertainty information included explicitly in warning messages.

Expressing probabilistic forecasts using language such as 'possible', 'extremely likely' and 'unlikely' is highly subjective. Limited research suggests that messages coming from the forecaster to end users can be misunderstood.

Using probability to express uncertainty is becoming more common, especially in the field of meteorological forecasts. Limited research carried out into end users' understanding of probabilities indicates that using percentages or frequencies transmits the forecaster's message most effectively.

Different users of flood warnings will have different requirements for probabilistic information as well as different levels of understanding. The engagement of specific user communities is important to be able to define their needs and the best way to present them with probabilistic information.

Limited end user surveys have shown that end users prefer probabilistic information to be displayed graphically or in the form of a map with an explanation in text. The choice of colours used to convey information for forecast maps is critical to the interpretation of probabilistic information. User surveys will need to be undertaken to identify suitable colour scales and explanations.

It would appear that when communicating probabilistic warnings to the public, putting the forecast event in context to a recently experienced event may help with the public's understanding of the message.

A review of literature on how the public and professional partners make sense of information about risk and uncertainty

The third review drew information from literature to determine how public and professional partners make sense of information about risk and uncertainty.

The review found that debates about public understanding of risk and uncertainty now tend to argue that probabilistic warnings are a good thing and that government are more open about uncertainty and risk.

Neither the public nor professional partners are a homogenous group. Existing research does not point to one single effective means of communicating probabilistic and uncertainty information to all parties. There may be issues with literacy and numeracy, and socioeconomic differences can also be very important in how information is received and interpreted.

There is limited research to draw on to understand how probabilistic information on the likelihood of imminent hazards is understood and used. However, research on weather forecasts tends to suggest that the public do understand basic probability information when it is presented clearly (for example, 'there is a 30 percent chance of rain tomorrow'). Research on public responses to probabilistic information for hurricanes suggests that residents do have a good understanding of probability information, but this did not influence decisions about evacuation.

The review has suggested that instead of trying to educate the public about the exact meanings of forecasts and probabilistic information, it may be more useful to understand how the public is likely to use the information. Developing an iterative process in

collaboration with end users would be a useful way of taking the development of probabilistic hazard warnings forward.

The findings of this project will help inform further research into the feasibility of future probabilistic flood forecasts and warnings. This will enable decisions on policies addressing the dissemination of probabilistic flood forecasts and uncertainty within flood warnings.

This summary relates to information from Science Project SC070060, reported in detail in the following outputs:

Science Report: SC070060/SR1

Title: How the public and professional partners make sense of information about risk and uncertainty – literature review

ISBN: 978-1-84911-101-0

September, 2009

Report Product Code: SCHO0909BQYF-E-P

Science Report: SC070060/SR2

Title: Communicating risk and uncertainty in flood warnings: a review of Defra/Environment Agency FCERM literature

ISBN: 978-1-84911-102-7

September, 2009

Report Product Code: SCHO0909BQYH-E-P

Science Report: SC070060/SR3

Title: Communication and dissemination of probabilistic flood warnings – literature review of international material

ISBN: 978-1-84911-103-4

September, 2009

Report Product Code: SCHO0909BQYI-E-P

Internal Status: Released to all regions

External Status: Publicly available

Project manager: Jacqui Cotton, Flood Risk Science

Theme manager: Claire Sunshine, Incident Management & Community Engagement

Research Collaborator: Collingwood Environmental Planning & Lancaster University.

Research Contractor: HR Wallingford, Howbery Park, Wallingford, Oxfordshire, OX10 8BA.

This project was commissioned by the Environment Agency's Science Department, as part of the joint Environment Agency/Defra Flood and Coastal Erosion Risk Management Research and Development Programme.

Email: fcerm.science@environment-agency.gov.uk

Further copies of this summary are available from our publications catalogue: <http://publications.environment-agency.gov.uk> or our National Customer Contact Centre: T: 08708 506506

E: enquiries@environment-agency.gov.uk.

© Environment Agency.