



## Theory into practice: understanding and communicating uncertainty in flood risk information

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In recent years it has been recognised that uncertainty information has an important role to play in Flood and Coastal Risk Management (FCRM) in England and Wales. The Environment Agency uses a risk-based approach to decision making across the whole of flood and coastal risk management. Uncertainty in risk assessments is a key factor in decision-making.

This paper describes a national view from a lead operating authority, looking across a wide range of information. It sets out work to date to understand and communicate uncertainty in flood risk information. It summarises where methods are already being used in practice, and where research is ongoing or required. It gives specific examples of how theory is being translated into practice with varying success, and the range of challenges and barriers that remain to be overcome.

Comparisons are made with other UK and Republic of Ireland regulatory authorities; limited evidence (van Alphen et al., 2009) suggests that uncertainty is rarely communicated elsewhere in Europe. Whilst the Floods Directive does not explicitly require uncertainty to be understood or communicated, its Working Groups present opportunities for sharing techniques and information.

Current or recent work to better understand uncertainty within FCRM includes:

- Adopting a probabilistic approach where appropriate - in order to assess, communicate and manage flood risk more effectively - and the challenge of measuring its effectiveness
- Improving our National Flood Risk Assessment (NaFRA) based on understanding the effects of uncertainty in the input data, with the challenge remaining to better understand the effects of uncertainty in the model
- Probabilistic flood forecasting to enable longer forecasting lead times and provide a measure of confidence in predictions
- Developing better ways to validate probabilistic risk information from models, to constrain uncertainty and determine what purposes information is fit for.

We are also working on ways to communicate uncertainty better, including:

- Using an understanding of uncertainty to communicate levels of confidence; for example using confidence classes such as those recommended by IPPC (2005), to give users of risk information a clear view of the quality of that information
- Moving away from controlling the scales at which risk information is mapped, to providing more open information which includes changing confidence at different scales
- Developing good practice for new information including describing levels of confidence for the Flood Map for Surface Water, and innovative approaches for mapping coastal erosion.
- Changing and managing perceptions of confidence in existing published information, particularly where users have traditionally assumed a relatively high level of confidence. For example, considering how land-use planners can use an understanding of uncertainty in flood risk assessments in their decision-making.

The Environment Agency is working to change attitudes to uncertainty and confidence information. These must be seen as informative and useful, enabling a positive attitude to flood and coastal risk management, and minimising the use of overly precautionary measures. Culture change will take time to happen but is essential if we are to see the full benefits of the risk-based approach.

van Alphen, J., Martini, F., Loat, R., Slomp, R. & Passchier, R. (2009) Flood risk mapping in Europe, experiences and best practices, *J. Flood Risk Management* 2 (2009) 285–292.

<http://onlinelibrary.wiley.com/doi/10.1111/j.1753-318X.2009.01045.x/abstract>

Intergovernmental Panel on Climate Change (IPCC) (2005) Guidance Notes for Lead Authors of the IPCC Fourth Assessment Report on Addressing Uncertainties. <http://www.ipcc-wg1.unibe.ch/publications/supportingmaterial/uncertainty-guidance-note.pdf>