

# Flood and Coastal Risk Management Risk Mapping Strategy 2010–2015



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# Foreword

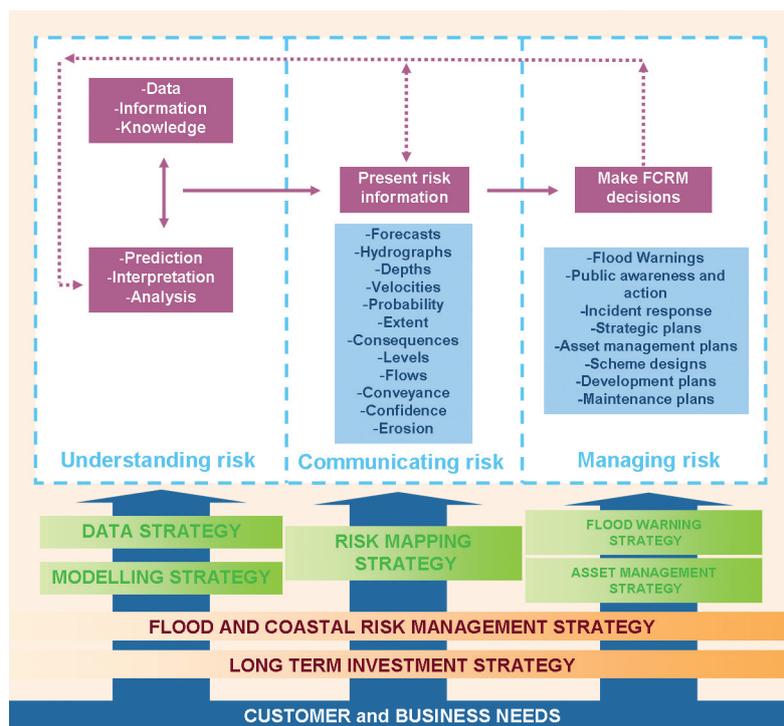
**One in six properties in England and Wales is at risk of flooding. It is one of the most serious problems the country faces, and one that requires a strategic and evidence-based approach to tackling it.**

Our data, modelling and mapping are the foundations on which effective management of flood and coastal risk depends. We are the national leader in flood and coastal risk information, and this information is the evidence base for our decision-making. And we use our data, models and maps to share information with our partners and communicate risk to the public.

Our Corporate Strategy, *Creating a Better Place*, and the Flood and Coastal Risk Management supporting strategy recognise that it is essential that we manage our risk information so that we have robust data, models and maps. To ensure a clear direction in this area, both for ourselves and for those we work with, we have produced three strategies that set out our approach to data, modelling and mapping over the next five years. They set out the actions required to deliver the outcomes contained in *Creating a Better Place: to recognise data, information and knowledge are assets and manage them accordingly; use environmental data to create compelling evidence that supports and informs our decisions and those of others and; we, our professional partners and the public will have a greater understanding of flood and coastal erosion risk.*

The three strategies are closely linked; you may benefit from reading them all. Our data is not only used in its own right, but also forms much of the basis for our modelling work. And we often communicate data and modelling outputs with maps.

Our strategic overview role in England, and our enhanced oversight role in Wales, is to guide, oversee and advise those partners taking on local flood risk management roles. The three strategies provide greater clarity for our partners about how we will use data, modelling and maps to provide information on risk from all sources of flooding.



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# 1. Introduction

## 1.1 What is mapping?

We invest approximately £17 million per year in modelling and mapping and an additional £15 million in gathering and processing data to support flood and coastal risk management. This data, modelling and mapping underpins all the decisions we make in Flood and Coastal Risk Management, including significant investment decisions.

Our Corporate Strategy states, under the theme ‘*work with people and communities to create better places*’, that we will:

***‘Better understand the risks of flooding and of coastal erosion and use this to embed a risk-based approach to our flood and coastal risk management’***

Our Flood and Coastal Risk Management supporting strategy states that:

***‘We, our professional partners and the public will have a greater understanding of flood and coastal erosion risk’***

‘Risk information’ is the term we use to describe data, modelling and mapping, which helps us understand flood and coastal risk and so improves our decision-making. Mapping is the method we use most often to present risk information:

- Mapping can help people to understand the likelihood of flooding and coastal erosion in their neighbourhood, and the impact it could have. It can also show the implications of changes that could occur (for example new defences, faster erosion, climate change) which could alter that risk.

- Mapping helps local authority planners to understand how flood risk may affect and be affected by development proposals, and it helps us and our partners plan how we will work together to respond when there is a flood.

When we use the term ‘mapping’, we also mean non-traditional forms such as three-dimensional mapping and animations which show flood and coastal changes over time. Animations may show how a flood may develop over a short time period, or longer morphological changes such as those experienced with coastal erosion. However, currently, these techniques are only available in a few locations.

## 1.2 Benefits of mapping

We use mapping in all aspects of flood and coastal risk management, including:

- deciding where to spend money on flood and coastal risk management measures;
- helping local planning authorities plan future development;
- when planning how to respond to flooding, and during a flood.

Risk mapping helps us to see where flooding or coastal erosion has occurred in the past and, with further data and modelling, to understand where it may occur in the future and with what likelihood and impacts. Mapping helps us to see where we should invest in creating, upgrading and maintaining structures in order to manage flood and coastal risk in the most effective way.

### Our vision:

- Everyone in an area at risk from flooding or coastal erosion will understand their risk.**
- We will understand what decisions we and our customers need to make, and ensure that we provide the necessary information in the most helpful way for making those decisions.**

Risk mapping is a way of combining complex data in a way that can convey clear information and help make decisions. This allows us to work with planning authorities in guiding future development and infrastructure in a sustainable way.

In planning our response to floods, and during flooding, we use our mapping to identify the areas at risk and what is contained within those areas. Mapping is also a powerful tool to explain to our partners what is happening, so that the most effective multi-agency response can be made to the developing situation. We use mapping to help identify who should receive flood warnings, and where we should be raising awareness of flood risk.

# 2. Current position

## 2.1 Our flood mapping products

We first published our Flood Map in 2004, under our previous mapping strategy that ran from 2003 to 2008. The Flood Map is published on our website and is regularly updated. It is the most comprehensive map ever published showing areas at risk from river and coastal flooding in England and Wales.

The Flood Map shows the predicted extent of river and sea flooding (if there were no defences) for two levels of likelihood. It also shows flood defences and areas that benefit from those defences.

The Flood Map does not show how flood and coastal defences affect the risk of flooding. However, we have developed a method for assessing risk that takes into account the presence of defences, their height, type of construction and condition. We currently apply this method to assess the national risk of river and coastal flooding in our National Flood Risk Assessment for England and Wales, which is also available on our website.

We also produce an Historic Flood Map, which shows the extents of past floods where we have this information. We keep this map updated with new information from recent floods, and distribute a revised version every three months to our staff and partners.

We supply the Flood Map and Historic Flood Map to many organisations, including local authorities, on a quarterly basis, to help them manage flood risk through development planning and emergency planning. We also sell the Flood Map to commercial organisations which supply specialist services to the public and others.

## 2.2 The way we present our mapping

### How we got here

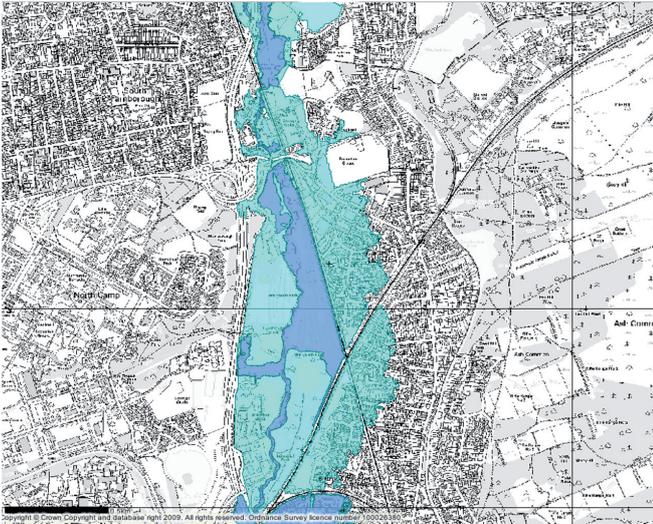
Over the past few years, we have been among the best in the world at assessing the risk of river and coastal flooding. We have used the most advanced technology and methods available to us to assess and communicate flood risk.

However, the limits of what was available to us meant that we mapped flood risk in a way that did not enable the range of flood risk for a particular location to be understood, and did not take into account all the factors which could affect that risk.

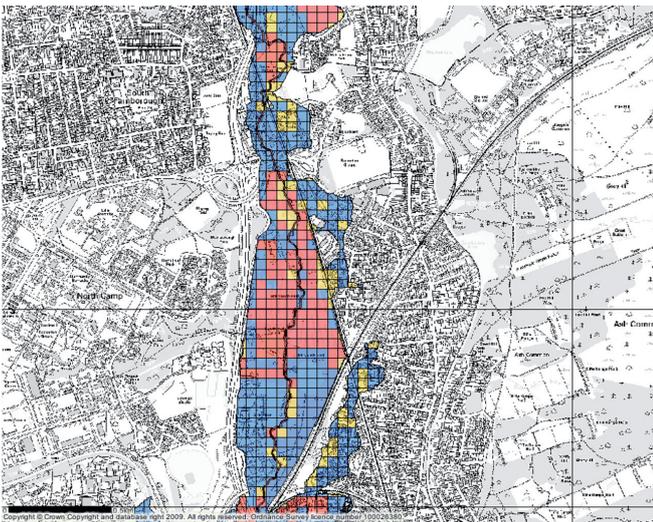
Our Flood Map shows an outline of an area at risk, but not the distribution of the risk within that outline. An area is either at risk from a flood of a particular magnitude, or not. This way of looking at mapping is an example of what is sometimes called a deterministic approach.

The Flood Zones are an example of this approach. Local authorities use Flood Zones as a screening tool during development planning, to answer the question 'Is this area of land at risk of flooding from rivers or the sea?' The answer allows planners and developers to decide whether to carry out a more detailed flood risk assessment.

In addition to these technological constraints, we had to take different approaches to meet different business needs, and as a result our maps may appear to present inconsistent information. For example, Flood Zones show two levels of likelihood of flooding, while the National Flood Risk Assessment divides likelihood into three categories. As a result it can be difficult to explain to the public just what information we have provided them with.



**Figure 2.1: Flood Zones showing Flood Zone 3 (dark blue) and Flood Zone 2 (light blue)**



**Figure 2.2: National Flood Risk Assessment showing significant (red), moderate (orange) and low (blue) likelihood of flooding**

### Where we are now

We have begun using a way of assessing risk that provides a far more realistic understanding of how likely an area is to flood. With this method, we can now talk about the *distribution* of the likelihood of flooding within an area. In other words, we can predict the likely extent of flooding in much more detail. This method is an example of what is sometimes called a probabilistic approach.

Our latest National Flood Risk Assessment uses this improved method of mapping flood risk. The national assessment helps us decide where to invest in flood and coastal risk management measures, based on what areas are most likely to flood and how much the damage is likely to cost. The method we've begun to use will allow us, in future, to take uncertainty into account, and include degrees of confidence about how much various factors could affect the extent and impact of flooding. It will also allow us to show a range of information, rather than just a best estimate, in our models and maps.

In some locations we have produced local information about the depth and speed of flood water, to meet particular development planning needs or to help plan emergency response. We have gained valuable experience from this work, and will use the skills and knowledge we have gained to help meet future challenges (for example, the requirements of the EU Floods Directive).

We have also mapped information on how climate change may affect the extent of flooding. This has provided valuable experience of how we should approach modelling and mapping of climate change, and the factors we will need to consider.

Due to technological and data constraints, our maps do not show the risk to individual properties.

## 2.3 Other forms of risk information

We communicate most of our risk information through mapping, but we also present this information in other ways. For example, our flood warning and forecasting tools use graphs to illustrate flood risk to our staff and partners. And the written or spoken word is often more appropriate for providing information to the public, such as leaflets or flood warnings.

Although we do not always present risk information as a map, the information is always geographically based. We need to know where something is and how it relates to what is around it, in order to understand and analyse information in a way that develops knowledge and helps us to make better decisions.

# 3. Reasons for change

Our Corporate Strategy *Creating a Better Place 2010-2015* clearly identifies the value of our data and information. The FCRM supporting strategy specifically identifies the need for ourselves, our professional partners and the public to have greater understanding of flood and coastal erosion risks. We therefore need to ensure that one of our primary means of communicating flood and coastal erosion risk, our flood and erosion risk mapping is capable of delivering that outcome.

## 3.1 Major influences

There have been dramatic changes to Flood and Coastal Risk Management over the past few years. These changes result in part from:

- major floods, such as those in summer 2007 which affected large parts of England and Wales; severe flooding of towns and villages such as Boscastle and Morpeth; and ‘near-misses’ such as the November 2007 high tides along the east coast of England;
- landmark reports (for example the EFRA committee report on the summer 2007 floods and the Pitt Review) with recommendations on developing tools and techniques and working with our partners to improve our understanding of flood risk;
- government strategies and policy direction, such as *New Approaches* in Wales and *Making Space for Water* and *Future Water* in England;
- major new legislation: the European Directive on the Assessment and Management of Flood Risks (the Floods Directive); the Flood and Water Management Bill; and the Flood Risk Regulations;
- independent reports reviewing how we communicate with the people we work with, showing areas where we can improve;
- the needs of other parties with an interest in flooding and coastal change, such as the Association of British Insurers and the National Flood Forum.

These developments have shown us where we and our partners need to improve on the work we do. At the Environment Agency, we need to meet the challenges presented by improving how we work with our partners and customers and how we manage, share and present information on flood risk and coastal change. We need to present the information that both we and our partners provide in a way that is intuitive and easy to

understand. And we must adapt our information to better meet the diverse needs of our own organisation as well as those of our partners and customers.

## 3.2 Our responsibilities

The roles of the organisations which deal with flood risk are changing; however the Environment Agency will continue to lead on modelling and mapping flood risk from rivers, the sea and reservoirs. As part of our strategic overview role in England, we will need to work with our partners to consider all sources of flooding, such as surface water and groundwater. And we anticipate that our enhanced oversight role in Wales will carry similar responsibilities.

## 3.3 Using uncertainty in a positive way

Flood and coastal change data, modelling and mapping are inherently uncertain. Uncertainty is a measure of the likelihood that factors we rely on in our calculations are accurate. Uncertainties are unavoidably introduced at every stage of the mapping process – in the input data (such as water levels, rainfall estimation or ground surface information), in the mathematical equations of the modelling used, and in the results.

In the past we have made decisions in spite of this uncertainty, rather than using it to improve our decisions. We have seen uncertainty as a negative aspect. Part of the challenge has been that, using existing tools, uncertainty has been difficult to fully assess or define.

We have worked with research consortia, such as the Flood Risk Management Research Consortium, to improve our capability for measuring, understanding and presenting uncertainty in flood and coastal risk management. Although there are still many challenges in working with uncertainty, our improved understanding can allow us to use it in a positive way.

We need to communicate more clearly that there is uncertainty involved in presenting risk information, and find ways to use this knowledge to help people make more informed decisions.

# 4. Where we will be in five years

We have developed eight principles that encapsulate what we want to have achieved by 2015. The Environment Agency's strategic overview role in England, and our enhanced oversight role in Wales, is to guide, oversee and advise. Our oversight role in Wales will be clarified through a future strategy specific to Environment Agency Wales. As part of these roles we will seek to ensure that those we work with also understand and adopt these principles, where appropriate, in their flood and coastal risk mapping.

## **Principle 1: Mapping of flood and coastal risk from all sources will be available from one place**

*Consultation has shown that our customers want all this information to be available together. This will also help us to meet the requirements of the Flood and Water Management Bill and the EU Floods Directive, and recommendations from the Pitt Review.*

We will:

- A1.1 ensure mapping of flood and coastal risk developed by others, where it meets our standards, can be accessed alongside our own mapping;
- A1.2 present the information on flood risk and coastal erosion in a way that helps people to understand the risks, and where appropriate take action.

## **Principle 2: Our mapping, to meet a diverse set of needs, will be based on a consistent approach and a single set of data**

*We will base all our mapping of flood risk upon a single common set of data, produced using a consistent approach, to ensure clarity and consistency. Where a smaller dataset is required to meet specific needs, we will extract it from this common set of data. We will ensure that we source data and information from the most appropriate organisations, where we are not the lead authority, to support the presentation of flood and coastal risk information in the best way possible.*

We will:

- A2.1 update our current National Flood Risk Assessment (taking a probabilistic approach) using improved data and methods, where appropriate, and include more detailed, local mapping in higher risk areas (using the same probabilistic approach). This will be our primary source of data to communicate flood risk;
- A2.2 replace the Flood Map with mapping developed using probabilistic methods;
- A2.3 review and update the data, method and types of coastal erosion covered, to improve this mapping, where appropriate;
- A2.4 stop using the Flood Zones as our primary source for communicating the chance of flooding to the public, but continue to use it to support local planning authorities in their development planning role (to support Planning Policy Statement 25 in England and, through Development Advice Maps, Technical Advice Note 15 in Wales);
- A2.5 take a risk-based approach to collecting and maintaining this information, including its quality and detail, that focuses on meeting both our needs and those of our partners and customers;
- A2.6 continue to record information on flooding from rivers and the sea.

## **Principle 3: Uncertainty (including climate change) will be addressed in our mapping**

*This principle will help to meet recommendations within the Pitt Review about supporting probabilistic forecasting and warning, and predicting the effects of climate change; it will help meet the requirements of the Floods Directive to consider the effects of climate change; and it will ensure that uncertainty is communicated as part of how we present risk information.*

We will:

- A3.1 use uncertainty in a positive way as part of the way we communicate flood and coastal erosion risk and make decisions;
- A3.2 work with our partners and customers to ensure we display uncertainty in ways that make it most understandable to them;
- A3.3 map climate change and present this information in a way that helps us plan for the future.

**Principle 4: A greater range of the impacts of flooding and coastal erosion, and the risk of flooding to a property level, will be considered**

*We need to look at the broad range of impacts that can occur from flooding or coastal erosion, both to help us get a better understanding of risk and to meet the requirements of the EU Floods Directive. This requires us (in the Preliminary Flood Risk Assessment) to look at 'the potential adverse consequences of future floods for human health, the environment, cultural heritage and economic activity'. Studies have shown that people want information about flood risk and coastal change to property level (i.e. their house) and often misinterpret our information as being property-specific already. We will assess whether we should now be mapping to that scale.*

We will:

- A4.1 develop a dataset that will include information about the sites affected by flooding and coastal erosion, including properties, significant environmental sites and sites of cultural interest. This dataset will be the single source which we will use to understand the impacts of flood and coastal risk;
- A4.2 investigate whether we can realistically assess risk to the property level in a cost-effective way, and, if so, determine whether we need to take a risk-based approach to the application of that method.

**Principle 5: Our methods will give us a broader picture of risk and will be used by our partners**

*Key reports, such as the Institution of Civil Engineers' Learning to live with rivers and the Foresight Future Flooding report, have shown how we need to use better risk assessment techniques which assess flood risk and*

*coastal change more realistically. Whilst the methods themselves relate directly to modelling, part of this risk assessment involves mapping to further analyse these results and, in some instances, communicate them.*

We will:

- A5.1 work with our partners to produce guidance on using the outputs of our improved methods to map flood risk for all sources of flooding, and encourage adoption of this guidance;
- A5.2 work with our partners and customers to ensure that, guided by research, we present the information on flood risk from all sources of flooding in a way that shows flood risk more intuitively;
- A5.3 meet requirements for depth and velocity mapping (formerly termed hazard mapping) through our improved method of mapping;
- A5.4 make sure that the way these new methods calculate risk is clearly understood and transparent to the users.

**Principle 6: Where appropriate, we will advise our partners on mapping of flooding from all sources including those sources for which they are the lead organisation**

*Under the Flood and Water Management Bill, responsibility for management of local flood risk (from sources other than main rivers or the sea) rests with other organisations. As part of our strategic overview role in England and enhanced oversight role in Wales, we will develop guidance and advise our partners to help them meet these responsibilities. We will not ourselves map flooding in detail from sources other than rivers, the sea and reservoirs, or record information on floods from these other sources.*

We will:

- A6.1 work with our partners to produce guidance, standards and, where appropriate, tools for risk assessment of flooding for sources for which we are not the lead organisation. We will encourage our partners to adopt these documents;
- A6.2 maintain a national dataset of historic flooding from all sources, using information collected and recorded by our partners to our standards.

**Principle 7: We will regularly review what we present and how it is being used**

*We provide information to meet specific needs, which is then often adapted for other purposes as needs change. This can lead to information being used in a way for which it was not originally intended and that might be inappropriate. By reviewing what we present and its uses, we will be able to adapt better to changes in customer needs, and re-use the information we have more effectively.*

We will:

- A7.1 be clear what is the intended use of any information we present;
- A7.2 regularly review the uses of the information we create, maintain and provide, and assess whether the needs of those using it have changed, or if there are new uses for it;
- A7.3 accept that needs do change, and respond to these changes, either through support and guidance or by providing new products where appropriate.

**Principle 8: Information will be published promptly and responsibly**

*We will continue to publish information in a timely way. We need to balance providing information promptly with making sure it meets a range of customer needs and does not hamper decision-making.*

We will:

- A8.1 ensure information meets identified needs before it is published;
- A8.2 work with our partners to ensure the most appropriate organisation publishes the information;
- A8.3 endeavour to highlight where information we provide has changed, and make available the reasons for those changes.

# 5. Next steps

## 5.1 Implementation plan

We will produce a high-level plan packaging together the actions in this strategy into a manageable number of coherent and prioritised work streams, with outline costs. We will identify any risks to achieving the actions and what can be done to guard against these risks. We will also identify any dependencies and related work led by other departments.

Our head office Mapping and Modelling team will own the high-level plan. Major projects will be carried out in partnership with our FRCM, Evidence and Operations Directorates; with Corporate Information Services (our IT department); and with external partners, such as local authorities.

The high-level plan will be used to inform internal service levels, which will detail specific actions required of Regional and Area staff. The high-level plan will also describe Area Flood Risk Mapping and Data Management teams' leadership role in supporting and advising other regional and area teams.

The plan will identify the skills and resources needed to achieve the *Risk Mapping Strategy 2010–2015*. The plan will be a live document that will be reviewed and updated regularly throughout its five-year lifespan. The strategy itself should not be affected by small changes in the way we do things. However, legislative or other high-level influences may affect the overall direction of the strategy. We will monitor any such changes and update the strategy if necessary.

We will communicate the strategy, and the plan to achieve it, to our colleagues in other Environment Agency teams and departments, and to our external partners.

## 5.2 How will we measure our success?

We will assess the success of this strategy by monitoring progress against a number of relevant measures. We have developed indicative draft measures (see Appendix 1) which will be finalised in the high-level plan.

The measures will be reported as a standing agenda item at the Mapping, Modelling and Data (MMD) Programme Board, which is chaired by the Senior Responsible Officer for Mapping, Modelling and Data. The measures and corrective actions put in place will be made readily available.

We will, over the duration of the strategy, develop further, outward-looking measures to help us understand how well we are working with our partners; and internal measures of service levels in our regions and areas.

# Appendix 1

## Indicative performance measures

### **Ma1: Looking out not in – meeting customer needs**

Description: The risk information we provide through various media, such as the internet or leaflets, answers the questions our customers are asking.

Measure: Customer surveys show they are satisfied with the information we provide.

Target: 80% by end 2013/14.

### **Ma2: Looking out not in – working with out partners**

Description: Our partners use the information, tools, techniques and guidance to help manage flood and coastal risk aspects for which they are the leads, and which helps us in our overview/oversight roles.

Measure: Information our partners provide to us, as needed under our overview/oversight role, meets the minimum standards we define.

Target: 100% by end 2013/14.

### **Ma3: Better – reviewing published information**

Description: We will review all risk information we publish to assess new customers and new or changed needs.

Measure: All published information will have a documented review which identifies changes in use from original or previously reviewed project scope, and new customers and new needs based on this information.

Target: 100% by end 2013/14.



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