



# Managing flood and coastal erosion risks in England

1 April 2013 to 31 March 2014

We are the Environment Agency. We protect and improve the environment and make it a better place for people and wildlife.

We operate at the place where environmental change has its greatest impact on people's lives. We reduce the risks to people and properties from flooding; make sure there is enough water for people and wildlife; protect and improve air, land and water quality and apply the environmental standards within which industry can operate.

Acting to reduce climate change and helping people and wildlife adapt to its consequences are at the heart of all that we do.

We cannot do this alone. We work closely with a wide range of partners including government, business, local authorities, other agencies, civil society groups and the communities we serve.

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# Executive summary

2013 to 2014 saw the wettest winter for 250 years in the south of England. The extreme weather tested the country's resilience to adverse weather and its consequences, causing flooding and disruption to energy supply and travel.

In early December 2013, a tidal surge hit the west and then the east coast of England. This was followed by a series of winter storms, causing flooding from rivers, the sea, surface water and groundwater. 7,700 homes and 3,200 commercial properties were affected by flooding. 49,000 hectares of agricultural land were affected and 50 of England's most important designated wildlife sites suffered damage. However, the investment in flood and coastal erosion risk management assets and operational response meant that 1.4 million homes and businesses and around 2,500 square kilometres of farmland were protected. We fully recognise that flooding can be devastating for those whose homes and businesses are affected.

In response to the winter floods, the government announced that it would provide risk management authorities with £130 million for flood recovery work, with £30 million to be invested by March 2014. The government also announced a further £140 million for repairing, improving and maintaining flood and coastal erosion risk management assets.

A number of reviews are currently underway to evaluate lessons learned from the winter floods and to help the country prepare better for future events. In March 2014, a report by the Intergovernmental Panel on Climate Change identified the costs and disruption of inland and coastal flooding as 1 of the 3 key risks for Europe resulting from climate change. It also emphasised the importance of adaptation in continuing to manage flood risk and coastal erosion.

In December 2013, the Environment Agency published new flood risk maps, showing the risk of flooding from rivers, the sea, reservoirs and - for the first time - surface water. They take flood risk management assets into account, giving people a more realistic view than ever before of their flood risk.

This year several new flood risk management schemes have been completed, reducing risk to over 36,000 households. The Medmerry scheme in West Sussex is the largest ever realignment of the open coast in the UK. The scheme will greatly improve the standard of flood protection for over 300 homes, a local water treatment works and the main road into Selsey. It will also create important new intertidal wildlife habitat and open up new footpaths, cycle ways and bridleways.

The Environment Agency has set up an Integrated Environment Programme to help identify opportunities so that wherever possible projects provide other benefits for people and the environment as well as reducing flood risk.

Almost a quarter of lead local flood authorities have now completed their local flood risk management strategy and over 40% have published their asset register. Risk management authorities continue to make progress in partnership working, for example through Public Service Co-operation Agreements, development of flood risk management plans, the sharing of data and resources with water companies and co-ordination during times of incident response.



Dr Paul Leinster CBE  
Chief Executive

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# 1. Introduction

Flood and coastal erosion risk management (FCERM) in England is the responsibility of risk management authorities. These authorities are the Environment Agency, lead local flood authorities (LLFAs), district councils, internal drainage boards (IDBs), water and sewerage companies and the Highways Agency.

This report provides a summary of FCERM in England, as required under section 18 of the Flood and Water Management Act (FWMA) 2010, and the National FCERM Strategy, published in 2011. It covers the period 1 April 2013 to 31 March 2014.

## 1.1. Scale of risk

### Risk from flooding

The Environment Agency continues to improve its understanding of flood risk from all sources and, in December 2013, published updated flood risk information. The number of properties in areas at risk of flooding from rivers, the sea and surface water is estimated to be:

- 2.4 million properties in areas at risk from flooding from rivers and the sea
- 3 million properties in areas at risk from surface water flooding
- approximately 600,000 properties in areas at risk from all 3 types of flooding

The risk to properties is defined as:

- high (greater than a 1 in 30 chance of flooding in any given year)
- medium (between a 1 in 30 and 1 in 100 chance of flooding in any given year)
- low (between a 1 in 100 and 1 in 1000 chance of flooding in any given year)
- very low (less than a 1 in 1000 chance of flooding in any given year)

The numbers of properties in areas at risk is set out in Table 1. The figures include non-residential properties such as churches, public houses, schools and offices.

**Table 1 Properties in areas at risk from flooding**

Level of risk	Number of properties at risk of flooding from rivers and the sea	Number of properties at risk of flooding from surface water
<b>High</b>	244,000 (153,000 residential)	282,000 (209,000 residential)
<b>Medium</b>	503,000 (350,000 residential)	490,000 (388,000 residential)
<b>Low</b>	1,603,000 (1,274,000 residential)	2,232,000 (1,809,000 residential)
<b>Very low</b>	93,000 (72,000 residential)	Not assessed
<b>Total</b>	<b>2,443,000</b> <b>(1,849,000 residential)</b>	<b>3,004,000</b> <b>(2,406,000)</b>

## Risk from coastal erosion

Coastal erosion risk is expressed differently from flood risk: erosion is a process which causes properties to be destroyed completely over time, while flood is a recurring risk which can happen time and again.

The Environment Agency estimates that 700 properties could be lost to coastal erosion over the next 20 years, and about 2,000 could be lost in the next 50 years. These estimates take into account the interventions proposed in shoreline management plans (SMPs). Without the interventions, these figures could increase to about 5,000 properties within 20 years and about 28,000 in 50 years.

## 1.2. Climate change and flood and coastal erosion risk

In February 2014, the Met Office published ['The Recent Storms and Floods in the UK' report](#)<sup>1</sup>. It says 'As yet, there is no definitive answer on the possible contribution of climate change to the storminess, rainfall amounts and the consequent flooding during this year. This is in part due to the highly variable nature of UK weather and climate. There is an increasing body of evidence that extreme daily rainfall rates are becoming more intense, and the rate of increase is consistent with what is expected from fundamental physics. There is no evidence to counter the basic premise that a warmer world will lead to more intense and heavy rain events'.

In September 2013, the Intergovernmental Panel on Climate Change (IPCC) published ['Climate Change 2013: The Physical Science Basis' report](#)<sup>2</sup> covering how and why the climate is changing. The main difference from the previous IPCC assessment report (2007) is that scientists now have increased confidence in the results. This reinforces the approach the FCERM community is taking to consider climate change in all plans and investment decisions.

The World Economic Forum published ['Global Risks 2014, Ninth Edition'](#)<sup>3</sup> in December 2013 setting out the 10 top global risks, in their view. 4 of those top 10 are climate-related. They include water crises, failure of climate change mitigation and adaptation, greater incidence of extreme weather events and food crises.

## 1.3. Legislation updates

### Flood and Water Management Act 2010

The latest phase of the FWMA came into force on 30 July 2013 in England. This amends the Reservoirs Act 1975 and changes how the Environment Agency regulates reservoirs in England.

### Flood Risk Regulations 2009

The Environment Agency published updated flood maps in December 2013, as required by the Flood Risk Regulations 2009. The new maps provide better information to communities about the risks from flooding and sources of risk that they face, so that they can improve their resilience.

This year the Environment Agency developed draft guidance to help LLFAs who are required to produce flood risk management plans (FRMPs). FRMPs will set out how risk management authorities will work together to manage flood risk.

The Environment Agency is developing FRMPs for all river basin districts in England to cover flooding from rivers and the sea. LLFAs have been invited to contribute local flood risk information to the Environment Agency FRMPs. This will ensure the FRMPs include as much information as possible about all sources of flood risk. Over 80% of LLFAs have already agreed to contribute to the plans.

## Water Act 2014

The Water Bill received royal assent on 14 May 2014. The Water Act 2014 includes a number of sections which are relevant to FCERM. It:

- enables flood defence consenting for the Environment Agency to be included in the Environmental Permitting Framework
- amends the Land Drainage Act 1991, simplifying the process of restructuring IDBs and advertising periods
- allows greater flexibility when amending flood risk maps and transfers responsibility for maintaining the maps from the Secretary of State to the Environment Agency
- amends charging schemes and rules to encourage take up of sustainable drainage systems (SuDS)
- helps make flood insurance in future more available and affordable

## Local Audit and Accountability Act 2014

The Local Audit and Accountability Act 2014 became law on 30 January 2014. It puts in place a new local audit and accountability framework for local public bodies in England, following the abolition of the Audit Commission.

Previously, councils have excluded Environment Agency and IDB levies when they have calculated council tax increases. These levies will now be included and the local councils must take them into account. This means that any changes to the levies will be subject to public scrutiny as part of any overall council tax increase.

## Regional flood and coastal committee appointments (RFCCs)

During 2013 to 2014, RFCCs have continued to represent communities across England against a challenging backdrop of significant flooding and funding pressures across the public sector. The Department for Environment Food and Rural Affairs (Defra) has appointed new RFCC chairs for the South West and Northumbria Committees. Existing chairs have also been reappointed for the Yorkshire, Anglian Central and North West Committees.

## 1.4. Performance against targets

In the financial year 2013 to 2014, work carried out by risk management authorities reduced flood risk for over 36,000 households. Over 24,500 of the households that benefit are in the highest risk category and almost 9,000 are in areas of significant economic deprivation.

In addition, over 4,500 households are now at reduced risk of coastal erosion, almost 200 of which are in areas of significant economic deprivation.

Forecasts show that working with partners including local councils and IDBs, the Environment Agency is on track to complete schemes which will reduce flood and coastal erosion risk to around 165,000 households in the period April 2011 to March 2015.

Despite sustained flood incident response, which required a great deal of extra energy use for pumping flood water, the Environment Agency emitted 47,900 tonnes of carbon dioxide in 2013 to 2014. This is a reduction of 8% (9,300 tonnes) compared to 2012 to 2013. This represents an overall decrease of 19% from a baseline of 60,000 tonnes emitted in 2006 to 2007. The target for the 2011 to 2015 spending review period is a reduction of 33%.



### Lower Tame flood risk management scheme, Staffordshire

The Coton flood risk management scheme is 1 of 4 projects making up the wider Lower Tame flood risk management scheme, which aims to reduce the risk of flooding to over 1,000 residential properties. Coton is the first section to be completed and will reduce the risk of flooding to 463 properties in the area.

The scheme consists of new flood embankments, flood walls and culvert improvements. The Environment Agency began construction of the £2.5 million scheme in October 2012 and completed it in June 2013, when it was officially opened by Christopher Pincher, MP for Tamworth.

The local community was involved throughout. Pupils from a local school visited the site to learn about the construction works and how the new scheme will reduce the risk of flooding to their local community. Members of the project team also visited the school and spent a day running flood-related activities for the children. The pupils attended the official opening ceremony.



## 1.5. Defra Triennial Review

In June 2013, Defra published its Triennial Review of the Environment Agency and Natural England. The review considered how the 2 organisations could best continue to achieve the government's priorities for the environment, with improved resilience in the face of current and future environmental and economic challenges. The report concluded that the Environment Agency and Natural England should remain as 2 separate non-departmental public bodies.

The review found opportunities to improve some functions and services. In response to the review, the Environment Agency and Natural England published a [joint action plan](#)<sup>4</sup>. It identifies how they will work together to get the best results for the environment from their water, flood risk management and biodiversity programmes, and improve their customers' experience.



## 2. Floods and coastal erosion this year

During the financial year 2013 to 2014, coastal, fluvial, surface water and groundwater flooding affected large areas of England. The year included the wettest winter on record and storm surges which, in places, saw record sea levels. At the end of March 2014, some parts of the country were still in response and recovery.

Risk management authorities are now reviewing the winter storms and floods, investigating the lessons they can learn to improve future emergency response and partnership working.

### 2.1. National summary of events

Although the winter flooding was extreme in many places, 2 of the 9 major flooding events recorded during this year took place during July and August 2013, flooding 650 properties.

At the end of October 2013, the St Jude storm had widespread effects across England. Four people died in the storm, and UK Power Networks reported that almost 650,000 customers were left without power. There was widespread disruption to travel on roads and railways.

Early December 2013 saw a tidal surge which affected the whole of the east coast, as well as some places in north-west and south-west England. Sea levels on the east coast reached heights similar to - and in places exceeding - those of the 1953 surge, testing and damaging coastal protection assets. There was significant flooding of homes and businesses around the Humber Estuary, 5 properties collapsed into the sea due to erosion in Hemsby, Norfolk and there was an increased risk of flooding to a chemical works in Teesside.

A succession of winter storms approaching from the south-west during December 2013 and January 2014 caused repeated and prolonged flooding to southern areas. Some areas on the Somerset Levels and Moors remained affected until April. In February, across the south of England 49,000 hectares of agricultural land were affected - around 3% of the total agricultural land at risk of flooding from rivers and the sea.

Between 1 December 2013 and early March 2014, the Environment Agency closed the Thames Barrier in London 50 times, comprising 30% of all closures since it first operated in 1982. It was closed 28 times during February 2014 alone, at one stage closing on 20 consecutive tides.

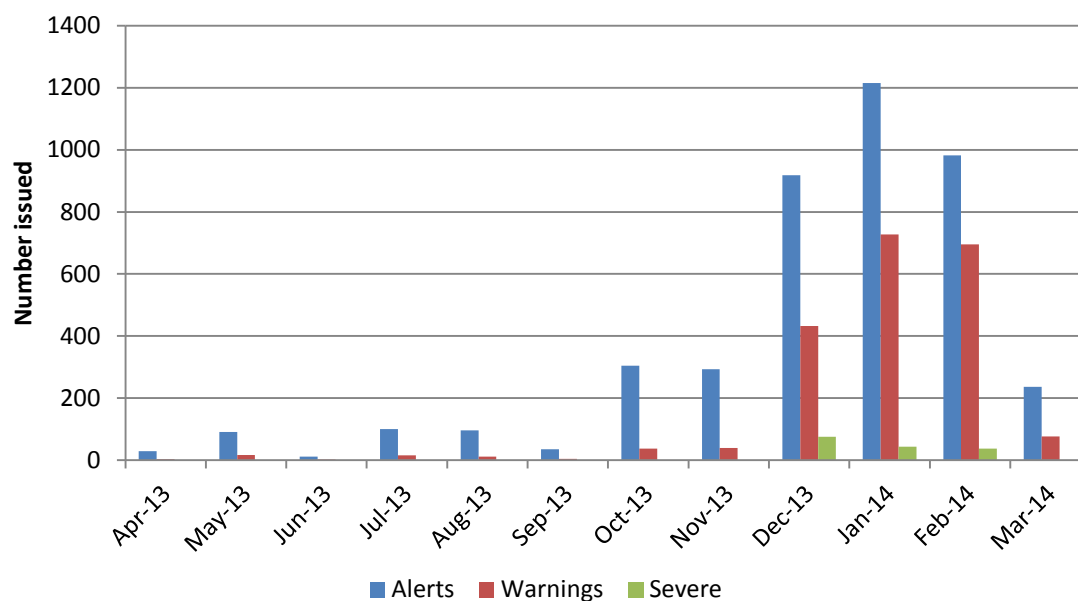


**Figure 1 Military support at Alney Island, Gloucestershire as part of 'Operation Pitchpole'**

Risk management authorities and professional partners worked together at multi-agency command centres across the country to help protect people and properties. The military also provided support during the flooding as part of 'Operation Pitchpole', helping to repair sea defences and put up temporary barriers, and assisting with pumping operations on the Somerset Levels and Moors.

The Environment Agency sent 4.2 million flood warnings to people with properties in areas at risk of flooding between 1 December 2013 and the end of February 2014. 155 severe flood warnings, meaning danger to life, were issued during this time. At one point, 64 severe flood warnings were in place. By comparison, during the floods of 2012 (April to December), 17 severe flood warnings were issued.

**Figure 2 Flood alerts, warnings and severe flood warnings issued during 2013 to 2014**



Counting the numbers of properties affected by or protected from flooding is challenging because the true extent of a flood may not be known for some time after an event. Numbers may change over time as more information comes to light.

The Department for Communities and Local Government (DCLG) is responsible for collating information on the number of properties affected. It reported on 9 June 2014 that over 7,700 homes and approximately 3,200 commercial premises were affected between early December 2013 and the end of March 2014. Between July and November 2013, 675 properties were reported as affected.

An estimated 11,575 properties were affected by flooding over the whole year. Disruption was caused by damage to infrastructure, and flood and coastal risk management assets were severely damaged. However, the investment in flood risk management schemes and operational response meant almost 1.4 million properties were protected from flooding.

## 2.2. Tidal surge - December 2013

On 5 and 6 December 2013, a storm surge coincided with spring tides producing east coast sea levels not seen since the surge of 1953. The surge and spring tide, combined with large wind-driven waves, also meant that water levels along the north-west coast were very high. Had the wind been from the east, the impacts along the east coast would have been even greater.

Communities along the Yorkshire, Lincolnshire, Norfolk, Suffolk, Essex and Kent coasts were most severely affected, and around 2,800 homes and businesses were affected by flooding. The Met Office and Environment Agency forecasted the surge accurately, and there were no deaths due to flooding. This was in contrast to the surge in 1953 when there were devastating impacts; more than 300 people died and 25,000 properties were affected by flooding.

Boston, in Lincolnshire, was one of the worst affected areas with the Lincolnshire Local Resilience Forum (LRF) reporting over 650 residential properties were affected by flooding. At Hemsby, Norfolk, 5 properties collapsed into the sea as a result of cliff erosion. Many thousands of residents were evacuated from vulnerable areas, such as Great Yarmouth. Seawater affected areas of high grade agricultural land, threatened important infrastructure and damaged a number of important wildlife and wetland sites, including at Blakeney in Norfolk.

### Dealing with the tidal surge in Lincolnshire

From 3 December 2013, professional partners began one of the largest multi-agency emergency response and recovery operations ever conducted in Lincolnshire. This included the evacuation of 203 residents from 78 households. Many more people evacuated their homes following advice from the Lincolnshire LRF. The fire services rescued 44 people from affected areas in the immediate aftermath of the flooding. In total, 670 residential properties were affected in Lincolnshire.



The flooding tested partners' capabilities and capacity, and the resilience and preparedness of the affected communities. Lincolnshire LRF held contingency planning meetings on 4 December 2013 to develop the working strategy and create multi-agency response 'surge task forces'. These were primarily made up of the police, fire and rescue service, flood rescue and pumping teams, East Midlands Ambulance Service, and county council highways teams. It enabled a flexible response to any developing threats.

IDBs on the east coast of England worked throughout the day and night to minimise the effects of the surge. On the evening of 5 December 2013, the sea wall at The Haven was breached. Wyberton Marsh pumping station in the Black Sluice IDB was put into full emergency action. Over the next 2 days, the 3 high-volume pumps were working non-stop. At one stage, the volume of seawater coming through the sea wall and flowing towards the pumping station was too great. Additional mobile pumps helped pump almost 200 million litres of seawater back into The Haven. Staff from adjacent IDBs brought in equipment to help at the pumping station and throughout the catchment.

## 2.3. Winter storms - December 2013 to February 2014

During December 2013 and January 2014 a series of winter storms swept across the country. Between 12 December 2013 and 31 January 2014, parts of southern England recorded over 5 months worth of rainfall compared with the long-term average. In the New Year there was another tidal surge, this time along the south and west coasts. Combined with heavy rain, storm force winds and high tides, the surge resulted in record sea levels at many locations.

### Effects of the winter storms in south-west England

The storms and high tides affected the Dorset coast particularly badly, including a loss of 150,000 cubic metres of shingle from the ridge at Chesil Beach. Environment Agency staff worked with the military and contractors to carry out emergency repairs and re-profile the shingle to protect the community from the large waves. A series of drop-in events kept the community informed about what was happening.

Across the Somerset Levels and Moors there was only 1 dry day in the whole of January 2014, compared with an average of 15 dry days in a typical January. At Bridgwater in Somerset, tides pushed water up into the estuaries in the Levels and Moors, meeting with high river flows heading downstream. This led to widespread flooding. On 24 January 2014, Sedgemoor District Council and Somerset County Council declared a major incident. At the height of the flooding, there were some 90 million cubic metres of floodwater on the Somerset Levels and Moors. 108 pumps were used to remove water, many of which were temporary pumps hired or brought in from other areas; 18 came from the Netherlands. Many of the pumps worked 24 hours a day to drain floodwater, with flow peaking at 8 million cubic metres per day.

Environment Agency assets protected 3,500 properties and over 200 square kilometres of land. However, about 170 properties were affected, with many more in Somerset surrounded by water and unable to use their septic tanks or drain waste water to the sewerage network. The villages of Muchelney and Thorney were totally cut off, with residents being transported by a boat provided by Somerset County Council. 36 roads across the Somerset Levels and Moors were affected for a number of weeks and the rail network to the south-west was cut off by the floods.

On 4 February 2014, the main railway line connecting London and Penzance, a key access route for the region, was severely damaged at Dawlish in Devon. A 100 metre length of the sea wall was destroyed by the storms, causing a stretch of railway to collapse into the sea.

On 6 February 2014, Network Rail engineers began work on site. A range of specialist contractors, engineers and suppliers were brought in from across the country to help with the work needed to repair the railway. The line was reopened on 4 April 2014.

### **Somerset Levels and Moors Flood Action Plan**

Somerset's councils, IDBs and local leaders prepared a 20 year action plan, in partnership with local and national organisations, including the Environment Agency. The plan was presented to the Secretary of State on 5 March. It builds on the extensive work already undertaken and the views of local communities in the catchments of the Rivers Parrett, Tone, Axe and Brue.

One of the first actions is to dredge 8 km of the Rivers Parrett and Tone. Contractors started dredging at Moorland House Farm on the north bank of the River Parrett on 31 March 2014. This followed several days of channel vegetation and tree clearance, and river bank stability testing to ensure the bank was strong enough to hold the machinery without slipping. During May and June 2014, up to 8 teams were dredging at different locations along both rivers. The government has announced £20.5 million of funding specifically for reducing flood risk on the Somerset Levels and Moors including dredging the Rivers Parrett and Tone. Dredging maintains the size and shape of the water course. It won't stop all flooding, but it will help carry water away more quickly.



The Environment Agency is making agreements with local farmers to find land for spreading the dredged material. It has also identified some stockpiling sites nearby, and is applying for planning permission to store dredged material. Some of this material will be reused for flood bank repairs and construction.

The dredged channels will require ongoing maintenance, as the tide brings in fresh silt every day. The benefits of dredging the rivers without maintenance would last approximately 5 years before the rivers would naturally re-silt. Local partners are discussing how best to raise funds to progress other work in the action plan.



## Effects of the winter storms in Surrey and the Thames Valley

On 23 December 2013, storm weather caused rising water levels in the River Wey in Surrey. In Godalming and Guildford, levels peaked in the early hours of Christmas Day. Godalming, Byfleet, Old Woking and Guildford - where levels rose to 2.5 metres above normal - were worst affected.

The amount of water flowing through the River Thames in January 2014 was the highest recorded for January since records began in 1883. The river level reached its highest level on 9 January in Oxford, 10 January in Reading and 11 January on the Lower Thames from Datchet to Teddington. High flows from the tributaries compounded the situation.

Oxford was one of the worst areas affected and there was major disruption to the city's transport infrastructure. Oxfordshire Highways closed 2 of the main routes in and out of the city and main railway lines were also badly affected.

By the end of January, levels on the River Thames were falling slowly. However, further heavy and sustained rainfall caused levels to rise again in early February. The Environment Agency issued 14 severe flood warnings on 9 February for locations along the River Thames.

On the same day, the Thames Valley and Surrey LRFs declared the flooding as a major incident. The worst affected areas were Datchet, Wraysbury, Old Windsor, Staines-upon-Thames, Egham and Chertsey.

In Datchet, Staines-upon-Thames and Windsor, the Fire and Rescue Service, with support from the military, erected temporary sandbag walls and put up demountable barriers. In Wraysbury, as part of a multi-agency response, more than 15,000 sandbags were distributed to individual households. In Chertsey, an 'aquadam' plastic tube filled with water was deployed with support from professional partners and contractors on 13 February 2014.

DCLG reported that approximately 1,400 homes and 400 commercial premises were affected in the Surrey LRF area between Christmas 2013 and the end of March 2014. In the Thames Valley LRF area, approximately 600 homes and 300 commercial premises were affected during the same period.

### How Thames Water dealt with flooding

Between December 2013 and March 2014, Thames Water reported an increase in flooding incidents when their sewerage networks became overwhelmed. The highest number of incidents occurred in the Guildford, Oxford, Reading and Slough postcode areas.

Thames Water teams worked around the clock to keep the network and pumping stations running and to maintain a service to customers. They set up special incident teams, with senior managers drafted in from all over the business. Calls to their customer centre tripled during the most severe rainfall. Their fleet of tankers was increased from 20 to 100.

The data Thames Water collected during the severe weather will help inform decisions about future planning and investment in sustainable, long-term solutions. It will also help them identify where unauthorised connections from properties and land drainage have significantly affected their network, allowing large volumes of water to enter systems designed only for sewage.

Thames Water has prioritised catchments where sewage treatment works have suffered from unexpected flow levels. They are producing plans to reduce flows for the top 20 catchments which will include short and longer term actions as well as long-term catchment monitoring.



## Groundwater flooding

Groundwater flooding can happen when the water within the ground itself rises to surface levels. Following the prolonged rainfall, groundwater levels rose significantly across southern England. In some aquifers, for example the North Downs aquifer, groundwater levels exceeded records set in the last major groundwater flooding in 2000 to 2001.

Groundwater flooding affected properties across Surrey, West Berkshire, Wiltshire, Hampshire, Dorset and Sussex. Most levels were at their highest between February and March 2014.

Groundwater flooding brings its own unique challenges for flood risk management. Flooding can last for months, affecting communities, transport and infrastructure.

### How Southern Water has worked to reduce groundwater flooding

In the past year, Southern Water has invested more than £6 million to survey and seal sewers and manholes in areas susceptible to groundwater flooding.

Southern Water carried out:

- improvement works to the sewerage network serving areas vulnerable to groundwater flooding
- investigations and repairs in villages along the River Nailbourne, the Lavant Valley and in St Mary Bourne

The benefits of this investment were seen in many catchments during the winter, Southern Water only needed to use tankers when higher groundwater levels than previously experienced were reached.

Southern Water estimates that the overall cost of dealing with flooding during 2013 to 2014 was £20 million. Tankering and over-pumping costs peaked at around £150,000 a day, with more than 330 staff involved and 117 tankers in use. At its peak, Southern Water was pumping out around 125 million litres a day of excess water from its sewerage system – enough to fill 50 Olympic sized swimming pools.

## Impacts of the winter storms on the environment

Natural England reported damage to 50 of England's most important wildlife sites, including Sites of Special Scientific Interest (SSSIs) and National Nature Reserves (NNRs). Some 4,500 hectares of designated coastal nature conservation sites in England were affected by December's tidal surge event. The sites affected mostly comprise coastal grazing marsh, saline lagoons and reed beds. All of the sites are of national importance and 37 are also of international importance. Sea walls which normally reduce risk to these conservation sites were breached in Norfolk, Suffolk and the Tees estuary.

The storms and prolonged rainfall also exacerbated flooding on inland SSSIs located on river floodplains, mainly on the Somerset Levels and Moors. Across the Somerset SSSIs, which are mostly floodplain grazing marsh, approximately 7,000 hectares were affected by flooding or subject to higher than normal water levels. The wetland wildlife of the area is naturally resilient to winter flooding and full natural recovery is expected. The Environment Agency has been working closely with Natural England since the storms to identify and complete repair works to wildlife sites protected by Environment Agency schemes, where they are considered to be sustainable.

## Economic impacts of flooding

Following significant flooding in 2012 to 2013, the Environment Agency developed a flood cost calculator. It has been used to provide preliminary information on the economic impacts of the winter flooding to residential property, businesses and the agricultural industry. The impacts are calculated from records of how many properties were affected, together with typical damage costs per property.

Based on this information, the estimated cost of the tidal surge that happened in early December is between £44 million and £83 million. The estimated cost of the flooding that took place from mid-December 2013 to mid-March 2014 is between £250 million and £650 million, with a best estimate of costs of approximately £400 million.

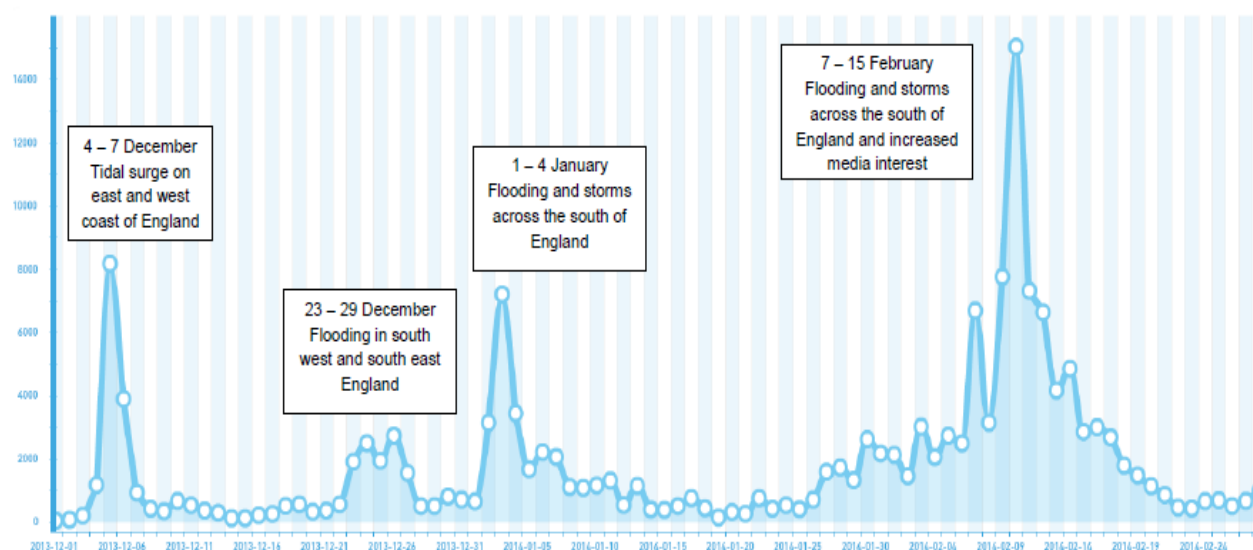
The Joint FCERM Research Programme will carry out a more detailed study of the incident to estimate the economic impacts of flooding. The programme expects to have initial results on non-household impacts by autumn 2014.

Both Thames Water and Southern Water have estimated the additional cost to them of responding to the flooding was in the region of £20 million.

## 2.4. Use of social media during flooding

Social media is an increasingly important communications channel during floods and helps risk management authorities engage with communities at risk of and experiencing flooding. During the winter floods, there were unprecedented numbers of conversations about the Environment Agency across social media, peaking at 14,575 mentions of the Environment Agency on 10 February 2014 (the equivalent to 1 mention every 6 seconds when averaged over 24 hours). During the flooding, social media directed 980,000 people to the Environment Agency website. Facebook and Twitter were the second and third top referral sites to the website, after the BBC website.

**Figure 3 Mentions of the Environment Agency across social media between December 2013 and February 2014**





## 3. Investment and funding

The risks from flooding and coastal erosion can never be completely removed. Risk management authorities share investment to reduce the risk and consequences of flooding across FCERM activities, including:

- building and maintaining flood and coastal erosion schemes
- improving flood forecasting and warning
- raising awareness and resilience across communities and sectors, such as business and agriculture

### 3.1. Income and investment during the year

In the 2013 spending review, Defra made a 6-year commitment to capital investment to reduce flood risk up to the end of March 2021. Defra will invest more than £370 million in the financial year 2015 to 2016, rising with inflation to over £400 million in 2020 to 2021. This long-term settlement is designed to enable the risk management authorities across England to:

- reduce the risk of flooding to at least 300,000 households between April 2015 and March 2021, on top of the 165,000 protected during the current spending period to the end of March 2015
- reduce the costs of building schemes and continue gaining efficiencies
- attract more contributions, such as partnership funding, from other sources

During 2013 to 2014, the Environment Agency invested £636 million on FCERM in England. Of this, £358 million was capital investment, including £71 million distributed to local councils and IDBs. Defra provided £568 million in FCERM grant-in-aid, which includes £30 million for repairing damaged FCERM assets and emergency response activities as a result of the winter flooding.

Other sources of investment included £31.5 million in local levy income provided by local councils to the 12 RFCCs, of which the RFCCs invested £29 million. The balances carried forward for future identified investment now total £37 million.

Large capital projects completed during 2013 to 2014 have whole-life benefits of £4.45 billion against whole-life costs of £368 million - a ratio of 16 to 1. Taking into account other capital expenditure over the spending review period, the overall programme benefit-to-cost ratio is 8.6 to 1.

### Investment for repair and recovery

On 6 February 2014, the government announced that it would provide local councils, IDBs and the Environment Agency with an additional £130 million, for flood repair and recovery work arising from the winter floods and tidal surges, with £30 million to be invested by the end of March 2014.

As of 19 June 2014, work has been completed on around 300 repair projects, restoring protection to around 115,000 homes and businesses. Around a further 600 projects have been identified that risk management authorities aim to complete work on by winter 2014 to 2015. These projects will help restore protection to around a further 230,000 properties.

In March 2014, the government announced in its budget statement a further £140 million for repairing and maintaining FCERM assets, making a total of an additional £240 million to be invested over the 2 years from March 2014. This additional funding will be used as follows:

- £70 million to maintain Environment Agency priority assets that protect high consequence areas (£35 million per year)
- £10 million to be spent implementing the Somerset Levels and Moors Flood Action Plan in 2014 to 2015

- £160 million to repair essential risk management authority assets that have been damaged since 5 December, and for one-off capital maintenance works needed to restore other Environment Agency priority assets in high consequence areas to their target condition. £135 million will be invested in 2014 to 2015 and £25 million in 2015 to 2016.

## Partnership funding

In 2011, Defra introduced a new partnership funding policy, seeking additional investment for flood risk management and coastal erosion schemes from local sources, such as councils and local businesses which would benefit from the scheme. Contributions to partnership funding may be in-kind or direct investment.

In 2013 to 2014, risk management authorities raised contributions valued at an estimated £55 million. £17.7 million of this contributed to Environment Agency-led FCERM projects, a significant increase from £5.4 million in 2011 to 2012 and £8.9 million in 2012 to 2013. £37 million was in the form of in-kind contributions and contributions towards projects led by other risk management authorities. 32 of the 54 major schemes starting construction in 2014 to 2015 are going ahead as a result of contributions from third parties and beneficiaries of schemes. The latest figures suggest at least £140 million in partnership funding will be invested between 2011 and 2015.

### Partnership funding to help protect Cockermouth, Cumbria

The town of Cockermouth suffered extensive flooding in November 2009, when 900 properties were affected by flooding. A new flood risk management scheme was completed in June 2013, reducing the flood risk to 361 homes and 55 businesses in Cockermouth from the Rivers Derwent and Cocker. The scheme protects against a flood event with a 1 in 100 (1%) chance of occurring in any given year.

The scheme consists of about 1.65 km of assets, including floodwalls with glass panels, embankments, flood gates, new flood warning telemetry, and a 120 metre self-closing flood barrier. The barrier will rise and fall automatically when the river floods. This is the first time that this type of barrier has been used to protect a community in the UK. A gravel management strategy is also in place to ensure the river channels don't get blocked.

The scheme cost £4.45 million, with £3.35 million coming from FCERM grant-in-aid. The remaining funding came from a local levy, Cumbria County Council, Allerdale Borough Council, Cockermouth Town Council and Flood Action Group, and local people, who voted to pay additional council tax to help to fund the scheme.

One of the main challenges was retaining and enhancing riverside views that are an important part of the historic identity of the town. The glass panels on the floodwalls help meet this need.

Through effective partnership working, the scheme provides a better protected environment for social and economic growth. Sue Cashmore, Chair of Cockermouth Flood Action Group said, 'It's fantastic that through working in partnership we have a flood risk management scheme in place that may otherwise not have been possible. This is the result of much hard work and I'm proud of the commitment shown by the Cockermouth Flood Action Group and local community.'



### 3.2. Efficiencies

During 2013 to 2014, the Environment Agency saved £20.7 million by improving the design, engineering and procurement for flood risk management schemes. Major contributors to these savings include:

- the Lincshire scheme, where costs were reduced by £4 million through better packaging and programming
- the Salford scheme, where costs were reduced by £1.6 million through innovation

The Environment Agency is planning to achieve further savings through the new Water and Environment Management (WEM) framework. It will be available for local councils, LLFAs and other risk management authorities to use.

### 3.3. Growth and acceleration funding

In the 2012 autumn statement, the government allocated an extra £120 million to enable risk management authorities across England to complete flood defence schemes earlier than originally planned.

9 schemes were allocated funding specifically because they offered the potential of up to £1 billion in economic growth benefits. Construction has already started on 2 of these schemes at Ipswich and Leeds and will start on the remaining 7 schemes before April 2015. A further 33 schemes, provided with funding to accelerate their completion, are at various stages of project development and are also due to start construction before April 2015.

### 3.4. Coastal erosion assistance grant

The Environment Agency administers the coastal erosion assistance grant on behalf of Defra. There is currently a fund of £60,000 available per year. The grant helps local councils to demolish houses at imminent risk from coastal erosion to avoid dereliction, ruin and debris, which could cause safety and socio-economic problems for the local area. Councils can apply for £6,000 per property or more if they provide justification.

Between 2010 and 2014, the Environment Agency awarded £164,000 out of a potential £240,000. A total of 24 residential properties are being or have been demolished using this grant.

### 3.5. Water company investment

Water and sewerage companies have invested £169 million this year to reduce the probability of sewer flooding to properties. This investment is part of their asset management plans for 2010 to 2015, agreed in 2009 with Ofwat (the water services regulation authority). Companies have also invested in maintaining the public sewer system, a vital part of national infrastructure, to prevent blockages, flooding and pollution.

**How RFCCs have worked with others to reduce risk**

Anglian Central, Anglian Eastern and Anglian Northern RFCCs, together with Anglian Water, used local levy to fund a flood risk planner to co-ordinate FCERM investment bids as part of the 2014 Water Price Review (PR14). An Environment Agency employee worked with local councils, Environment Agency officers and Anglian Water staff to identify joint approaches to reduce flood risk to include in Anglian Water's business plan for PR14.

As a result, Anglian Water has put £8.4 million in their PR14 business plan for partnership schemes. A further £2.3 million has been included for flood resilience measures. £34.3 million has been proposed to reduce the risk of surface water flooding and internal sewer flooding and for SuDS. Over 50 partnership schemes have been put forward as a result of this initiative.

Robert Caudwell, Chair of Anglian Northern RFCC said he is “really pleased that the level of partnership working on PR14 with Anglian Water has shown a lead to other RFCCs and water companies. This will deliver a more joined up programme of works between the risk management authorities to the benefit of all residents and businesses in the region”.

## 4. Reducing risk and minimising consequences

Improving awareness and understanding, and improving community resilience will reduce the risks of flooding and coastal erosion and help recovery efforts when flooding and erosion happens. The National FCERM Strategy, published in 2011, sets out objectives for risk management authorities working together to reduce the risk and consequences of flooding. These include:

- putting long-term strategic plans in place
- avoiding inappropriate development in areas at risk from flooding and coastal erosion
- building, maintaining and improving FCERM assets
- increasing resilience, through raising awareness and improving forecasting and warning

### 4.1. Strategic planning

#### **Flood risk and river basin management plans**

The river basin and flood risk management planning processes will help identify common priorities and opportunities to manage watercourses and coastal areas in ways which can be beneficial for people and wildlife. Plans are prepared on a 6-yearly cycle, and will be published in December 2015. They set objectives and measures which help local councils and communities make the best decisions for their areas.

Under the EU Floods Directive, the Environment Agency is required to prepare FRMPs for all river basin districts in England. This first cycle of plans must cover flood risk from main rivers, reservoirs and the sea. LLFAs are required to prepare FRMPs for areas with a significant risk of flooding from local sources (surface water, ordinary rivers and groundwater).

This year, the Environment Agency has been working with LLFAs, Natural Resources Wales and the Scottish Environment Protection Agency (SEPA) to develop guidance on the preparation of FRMPs for cross-border river basin districts.

The Environment Agency is working with others to prepare the second cycle of river basin management plans (RBMPs), which identify the state of, and pressures on, rivers, lakes and the sea. 13% of the rivers that are failing to achieve good ecological status under the Water Framework Directive are failing due to flood risk management infrastructure. Long term, the challenges caused by coastal erosion are also significant for wildlife and habitats: about 2,200 hectares of European sites and priority habitat on the coast could be lost by 2025. The planned FRMPs and RBMPs help risk management authorities and communities start dealing with these challenges.

Across western Europe, eel numbers have dropped sharply in recent decades. One major reason is that man-made structures such as weirs and dams are stopping young eels reaching the freshwater habitats where they mature. The Environment Agency has now located the majority of barriers to eel migration and work is now underway to remove them.

To meet requirements of the EU Habitats and Birds Directives, the Environment Agency creates new habitat to compensate for loss and damage, or predicted loss, of European designated habitat. During the year, the Environment Agency, local councils and IDBs:

- created 434 hectares of water dependent habitat
- restored 5 km of rivers
- created 735 hectares of priority habitat through FCERM programmes
- removed 28 barriers to allow eels to get into previously restricted rivers and wetlands



A recent project to identify the additional benefits of FCERM schemes suggested that schemes completed during 2013 to 2014 provided improved protection to around 84,000 hectares of agricultural land. Although only an indicative figure, this shows the benefit of such work to rural communities.

### **Medmerry realignment scheme**

On 4 November, Environment Agency Chairman, Lord Chris Smith unveiled a plaque to celebrate the completion of the Medmerry realignment scheme in West Sussex. The £28 million scheme involves the largest realignment of the open coast ever in the UK.

The project provides 7 km of new embankments, protecting almost 350 properties. It also creates a large nature reserve at Medmerry and 183 hectares of intertidal habitat.



Now the embankments have been completed, work is ongoing to finish 10 km of new footpaths, cycle ways and bridleways that cross the site.

The Royal Society for the Protection of Birds will manage the wildlife habitats and access, and the Environment Agency will continue to manage the flood risk management aspects.

## **Integrated Environment Programme**

This year, the Environment Agency and Natural England set up the Integrated Environment Programme. The programme will help risk management authorities co-ordinate and integrate flood risk and water management, and plan how to achieve environmental results during the 2015 to 2021 spending review period.

## **Shoreline management plans (SMPs)**

The 20 SMPs covering England – 2 of which cross the border with Wales - set out strategic management approaches for the whole coast, agreed by local communities and interested organisations, such as environmental bodies and infrastructure providers. Policies to maintain, build, remove or realign coastal flood and erosion risk management assets, or not to intervene at all, are set out for 3 approximate planning horizons - 20, 50 and 100 years - from a 2010 baseline.

Local councils lead on the development of 16 SMPs, with the Environment Agency co-ordinating the remaining 4 in East Anglia and Kent. All have been approved by the Environment Agency except the 2 cross-border SMPs, and the SMP for north Devon and Somerset (Hartland Point to Anchor Head) which await decisions on Habitats Directive assessments.

Coastal groups, which bring together local council, RFCC and other risk management authority representatives with other expert partners, developed and now oversee the implementation of SMPs, using a consistent and transparent process. Many SMP actions are designed for the long term. The actions may depend on each other and may also evolve as coastal groups develop more localised management plans. If there are major changes to an SMP, the coastal group will consult with the public.

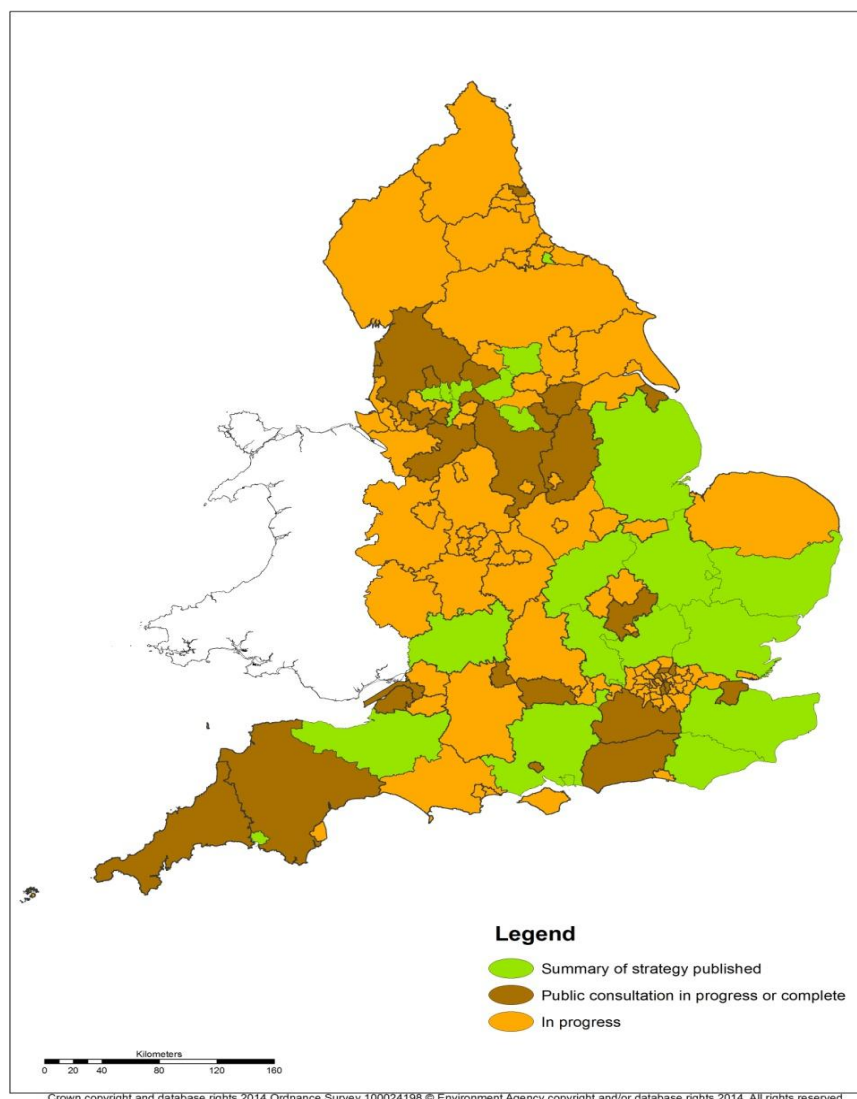
There are 2,788 actions in the 20 SMPs. At the end of March 2014, 243 were complete, 1,181 were progressing, 463 were planned or programmed, 44 were cancelled and 136 were on hold. The remainder were unspecified.

There are now 34 more actions in SMPs than there were in 2012 to 2013, as new ones have been added in response to ongoing activity. In 2013 to 2014 coastal groups reported 54 minor changes to their SMPs, but there were no changes to management policy options. There are likely to be some changes to management policy options in the coming year due to the effects of the winter storms.

SMP governance is a priority for 2014 to 2015, with the aim of reducing the number of 'unspecified' actions to zero. This will both improve understanding of progress and encourage enhanced ownership of SMPs as living documents. It should also encourage risk management authorities to make decisions in line with the approved SMP.

## Lead local flood authority local flood risk strategies

**Figure 4 LLFA progress in developing flood risk management strategies during 2013 to 2014**



The FWMA requires LLFAs to develop, maintain, apply and monitor strategies for managing local flood risk (from surface water, groundwater and ordinary watercourses) in their areas (section 9). Each year, the Environment Agency collects information from LLFAs regarding their progress developing these strategies.

All 152 LLFAs responded to the information request, and the responses show a marked improvement since last year.



In March 2014, 24 LLFAs said they had completed and published their local strategies, an increase from only 5 last year. 34 LLFAs said their strategies were out for public consultation or their consultations were complete, nearly double the figure from last year. 94 LLFAs said their work on local strategies was in progress.

The FWMA also requires LLFAs to investigate flooding in their areas, publish the results of their investigations and notify other relevant risk management authorities about them (section 19). Across the 152 LLFAs, over 200 section 19 flood investigations have been published this year, and a further 700 are in progress. 17 LLFAs were carrying out 10 or more investigations.

## 4.2. Avoiding inappropriate development

The National Planning Policy Framework (NPPF) sets out government policy on new developments, which must be applied by local planning authorities (LPAs) when making land use planning decisions. FCERM is an important consideration when determining planning applications. The Environment Agency advises the LPA and, in some instances, is a statutory consultee for flood risk reasons.

Government policy does not preclude development in areas at risk from flooding or coastal erosion, as this could constrain the viability of existing communities. However, where development does go ahead, it must be shown to be necessary, safe and resilient to flooding, and it must not increase risk to others.

The Environment Agency does not object to development in flood risk areas where that development complies with the NPPF. Examples of resilience measures which would allow development to go ahead in a flood risk area include:

- having adequate flood risk mitigation, such as flood risk management schemes
- floor levels being above the expected flood levels
- demonstrating the safety of people in and around buildings

Each year the Environment Agency provides comments on applications and is notified about decisions for planning applications to which it has objected at some point in the past. The decision notices received during each year do not necessarily match the initial objections made in the same period.

In 2013 to 2014 the Environment Agency provided detailed technical comments on 9,868 planning applications. The Environment Agency initially objected to 2,885 applications and continues to work with LPAs and developers to resolve issues so that, in many cases, the initial objection can be removed before a decision is made.

During 2013 to 2014, the Environment Agency was notified of 1,815 planning decisions for planning applications to which it had objected at some point in the past. This includes:

- initial objections that were later removed because a solution was found before the LPA made its decision
- sustained objections, where no solution could be found before the LPA made its decision whether to grant or refuse the application

Based on the 1,815 decisions which were notified to the Environment Agency in the reporting period 2013 to 2014:

- across all development types, 97% of planning outcomes were in line with Environment Agency advice
- over 99% of 58,161 new homes had planning outcomes in line with Environment Agency advice

Planning outcomes are counted as being in line with the Environment Agency's advice when applications with flood risk issues have been:

- refused by the LPA
- withdrawn by the applicant before an LPA decision could be made

- found to be acceptable following further investigation, for example, when a suitable Flood Risk Assessment was provided by the developer
- redesigned by the developer to be more flood resilient following detailed discussions with the Environment Agency and other technical advisers

The Secretary of State for Communities and Local Government 'called-in' one application for determination for flood risk reasons under the Town and Country Planning (Consultation) (England) Direction 2009 but it was not determined by the end of March 2014.

### 4.3. Maintaining and improving defences

#### Asset condition assessments

The Environment Agency maintains 7,000 km of walls and embankments on main rivers, 1,000 km of coastal risk management assets, 22,600 structures and 39,000 km of channels. Local councils, IDBs and private riparian owners are responsible for maintaining a further 1,700 km of walls and embankments and 9,600 structures to manage river flooding.

Risk management authorities carry out routine maintenance on flood and coastal risk assets to manage deterioration and ensure they are ready to be operated if there is a flood incident. The effectiveness of maintenance programmes is monitored by asset condition assessments.

Following the winter floods, Environment Agency flood asset inspectors and our consultants trained over 200 members of the armed forces to assess and record the visual condition of over 150,000 flood risk management assets across the country. The work was completed within 6 weeks and follow-up engineering assessments of assets identified for more detailed inspections were completed at the end of May 2014.

In 2012 to 2013, 98% of Environment Agency-maintained assets in high consequence systems were at or above target condition. The inspections carried out between January and April 2014 show that this figure has reduced to 94%. Third-party maintained defences have shown a similar deterioration, from 97% last year to 94% this year.

Direct damage has been caused to many flood and coastal assets as a result of the prolonged and extreme floods and storms. The need to prioritise resources on maintaining the most important assets, and delayed maintenance work due to bad weather and poor ground conditions, have also played a part. The additional £270 million over 3 years announced by the government will help to bring the Environment Agency's assets in high consequence systems back to 97% in target condition, as well as funding repairs and improvements to other flood and coastal risk management assets.

#### Reservoirs

Under the Reservoirs Act 1975, the Environment Agency is responsible for regulating the 1,774 third-party-owned large raised reservoirs in England. This is an increase of 25 since last year, as there are some new reservoirs and some existing reservoirs have re-registered. The Environment Agency also operates 207 large, raised reservoirs, mainly for flood risk management purposes. The act aims to ensure that dams and reservoirs are safe.

The FWMA amended the Reservoirs Act this year requiring the Environment Agency to designate high-risk reservoirs, where 1 or more lives could be lost if there were a sudden release of water. Only large, raised, high-risk reservoirs will have to meet the full requirements of the Reservoirs Act.

Reservoirs that are not high-risk will no longer have to comply with the inspection and supervision requirements of the act. The Environment Agency expects between 10% and 25% of reservoirs to be deregulated because there would be a negligible risk to life if they failed.

The Environment Agency has published maps on its website since 2010 showing areas at risk from flooding in the unlikely event of a reservoir failure. In March 2014, it also published indicative depth and velocity maps for flooding from reservoirs. The new maps will help members of the public understand if they are at risk from reservoir flooding, and who they can contact for further information.

During 2013 to 2014, there were 6 reports of dams or reservoirs in England at potential risk of failure. This compares to an annual average of 7 reports. All 6 reports were made in January and February 2014, during the height of the winter flooding.

The Environment Agency published its 2011 to 2013 biennial report on regulatory and operational activities under the Reservoirs Act during the year.

### Lead local flood authority asset registers

The FWMA requires LLFAs to establish and maintain a register of flood risk assets and arrange for the register to be available to the public (section 21). Almost all of the 152 LLFAs have progressed this work in the last year.

**Table 2 LLFA progress in developing asset registers**

Progress with asset registers	March 2013	March 2014
Populated and available for public inspection	50	64
In progress	96	85
Work yet to commence	6	3

### Water and sewerage companies

Water companies have worked with others this year to:

- share information to assess flood risk
- help with FCERM activities, such as strategic planning and construction of schemes

Discussions about the water company 5 yearly Price Review 2014 (PR14) and partnership funding have highlighted significant opportunities to work with partners to:

- reduce the risk of sewer flooding
- increase the resilience of infrastructure
- protect more properties from all sources of flooding and coastal erosion

### Highways Agency

This year the Highways Agency has reviewed its assets that are vulnerable to flooding. It has developed a flood risk management strategy to improve network resilience and its understanding of how climate change will alter flood risk. It has also developed:

- Severe Weather Plans to identify locations vulnerable to disruption, and plan how to reduce impacts and improve resilience
- a new weather information service to help inform decision-making in response to severe weather, including flooding, and manage demand on its network

The Highways Agency has also implemented a Crisis Management Manual that provides policy and guidance on how to respond to severe weather. This includes guidance on how to work with its supply chain and other emergency responders.



**Figure 5 Highways Agency inspecting a flood on the A303 in Somerset in December 2013**

### **Internal drainage boards**

The Public Sector Co-operation Agreement has greatly facilitated partnership working. It formalises how an IDB can take on work on main rivers that the Environment Agency would previously have done. For example, South Holderness IDB has taken over the maintenance of 2 rivers.

In 2013 to 2014, 14 agreements involving IDBs have been implemented, over time periods ranging from 3 to 10 years. Agreements include maintenance operations, vegetation clearance, channel management, sediment surveys, and implementing flood risk and surface water management strategies.

## **4.4. Improving resilience**

### **Coastal flood risk**

The coastal floods which hit England during December 2013 and January 2014 showed that coastal flooding is one of the most significant natural hazards facing the UK.

Most FCERM assets held during the December 2013 and January 2014 floods, protecting hundreds of thousands of people. Where damage did occur, the arrangements previously set up with contractors and the military meant urgent repairs could be made rapidly.

The Department for Transport worked with east coast port operators to raise their awareness of the risk, ensuring those ports which did flood were able to recover as quickly as possible. More improvements are planned in some ports to improve their resilience against flooding.

### **Improved guidance**

The government's national coastal flooding group developed the ['Emergency Response and Recovery' guidance](#)<sup>5</sup> published in July 2013 to:

- provide an overview of the phased central government responses to a wide area coastal flood
- describe the trigger points, the strategic framework and the mechanisms used to support the national response
- help local organisations and emergency planners develop operational plans

## Flood hazard mapping

On the east coast, enhanced flood hazard mapping of the areas at greatest risk, and the good co-operation developed during the preparation of emergency response plans, proved invaluable to the Environment Agency, local councils and emergency services in December 2013. More people were aware of the risks and agencies were better able to respond when the surge and subsequent floods occurred.

## Property-level protection

Defra launched the Flood Resilience Community Pathfinder scheme in December 2012 to fund innovative community responses to increase flood resilience. 13 communities benefitted from a £5 million fund to come up with innovative projects that will better protect homes and businesses from the risk of flooding. The scheme supports community action to ensure that projects really work for local people. The National Flood Forum is involved in a number of the projects and is also working to encourage collaboration and sharing of experiences among the projects. The projects are now halfway through and are due to be complete by April 2015. In February 2014, Defra published a 'Rapid Evidence Assessment' reviewing academic literature on resilience and communities, which helps to provide a framework for the findings of the scheme.

The Environment Agency has been working with Defra and with manufacturers, including the Flood Protection Association, to develop and encourage best practice in manufacturing and installing flood protection products. The Environment Agency is sponsoring the British Standards Institution (BSI) to develop an updated Kitemark® accreditation for flood products, which will be available later this year.

In November 2013, the National Flood Forum launched its online [property protection advisor](#)<sup>6</sup>, as well as other guidance, bringing information on property-level protection together in one place. The property protection advisor allows people to enter basic details about their property to estimate how much it would cost to protect their home from flooding using flood protection products. The tool creates a tailored report highlighting cost-effective measures that are available and directing householders to further information. It has attracted significant interest from households affected by this winter's floods, including those who may be eligible for the government's '[Repair and Renew Grant Scheme](#)'<sup>7</sup>.



## 5. Development and innovation

Joint projects, training, research and development are important in helping risk management authorities share information and good practice, and improve performance and efficiency.

### 5.1. Improving knowledge and expertise

#### Capacity building

Since 2010, the local council capacity building programme has run in parallel with the implementation of the FWMA. Throughout this period, the programme has supported LLFAs to develop their knowledge, skills and capacity by providing workshops, e-learning and seminars. Over the last 4 years, the programme ran 101 training and information exchange workshops. In October 2013 it ran workshops to help local councils prepare for the implementation of SuDS and SuDS Approving Bodies (SABs).

During 2013 to 2014 the programme also published 7 new e-learning modules on a range of topics, including flood and coastal erosion legislation and a module on SUDs and SABs.

In 2013 28 students graduated from the Environment Agency's Foundation Degree course in river and coastal engineering, 21 of whom had been on placement with LLFAs. 21 new students started the course in September 2013.

In the last year the programme has moved from a Defra and Environment Agency-led approach to an LLFA-led approach, managed by a new local council Capacity Building Advisory Group. In future, risk management authorities will encourage initiatives to build capacity where there is strong demand and there is sponsorship or partnership funding to support them.

In April 2013, the programme ran an online survey to understand its impact in improving awareness, skills and capabilities of staff working on flood risk management within local councils. 113 (74%) of the 152 LLFAs in England responded, with 140 staff taking part.

The results were compared with a similar survey in 2012 and the baseline survey carried out in 2010. They clearly show that the programme has helped LLFA staff to become more capable in carrying out their flood risk management roles:

- over 50% of LLFA staff rate themselves as 'capable or better' in 12 key knowledge areas associated with their role
- 91% of LLFAs feel more confident in carrying out their role than a year ago and, of these, 98% confirmed the capacity building programme contributed to their increased confidence
- 56% of LLFA staff have more than 20 years of professional experience. However, this experience is generally in other disciplines, with 56% having less than 5 years experience in flood risk management
- 56% of LLFA staff have made use of the e-learning modules and 80% of these found them 'useful'

#### Research and development

The Joint FCERM Research and Development Programme is run by Defra, the Environment Agency, Welsh Government and Natural Resources Wales. The programme provides evidence, information, tools and techniques to flood and coastal risk management authorities in England and Wales. It ensures that high quality science is being used to develop government policies and operational tools, giving real benefits to those at risk of flooding.

This year's programme has produced new or updated guidance including:

- a [practical guide for asset managers](#)<sup>8</sup> to assess the condition of typical flood and coastal risk management assets and how much life is left in them
- a [healthy catchments online guide](#)<sup>9</sup> to help with managing water for flood risk and the Water Framework Directive

- ['FCERM: a manual for economic appraisal'](#)<sup>10</sup> (also known as the Multi-Coloured Manual), which contains the data, methods and guidance required to calculate the economic damages of floods and the benefits of investment to reduce flood risk
- [guidance for beach modelling](#)<sup>11</sup>, a report for coastal practitioners based on learning from previous schemes

Risk management authorities are working with the Construction Industry Research and Information Association (CIRIA) and other industry partners to update the SuDS guidance. CIRIA will also produce guidance to help estimate the value of benefits of SuDS to encourage more partners to use SuDS. The guidance is planned for spring 2015.

Links with academic research have increased via research council programmes. The joint research programme is currently influencing over £35 million of research funded by the Natural Environment Research Council (NERC), the Engineering and Physical Sciences Research Council (EPSRC) and the EU.

The Environment Agency is working with partners to update the Local Flood Risk Research Framework. The framework, set up in 2008, helped co-ordinate over 85 research projects producing guidance, tools and applied research across subjects such as SuDS, communicating flood risk, small catchment hydrology and model benchmarking. The updated framework will outline a 5-year programme co-ordinating research for surface water, groundwater and ordinary watercourses.

### **'Slowing the flow' at Pickering, North Yorkshire**

Historic changes in upland management practices in this steep catchment have increased the risk of flash floods in Pickering. The town has a long history of flooding including 4 significant floods since 2000. Local individuals and organisations have worked in partnership since 2008 to bring together a complex and innovative combination of measures and contributors for a new flood risk management scheme. The risk of flooding is being reduced through measures managed by a local partnership comprising:



Forest Research, Defra, North Yorkshire County Council, Ryedale District Council, Pickering Town Council, Yorkshire RFCC, the North York Moors National Park Authority, Forestry Commission England, Natural England, Durham University, the Environment Agency, the North York Moors Railway and the local community. The 3 inter-related elements with a variety of partner funding contributions are:

- measures such as tree planting, installation of woody debris dams, blocking moorland channels and catchment sensitive farming practices are restoring the catchment's flood attenuation capacity by managing better upstream land and run-off. Forestry Research is leading this element
- a flood-water storage facility built by the Environment Agency which will reconnect the river with its natural flood plain and reduce significant risk to 50 homes and 30 businesses. Construction began in autumn 2013.
- Ryedale District Council's property-level protection scheme will also improve protection for up to 20 homes within the town.



The programme continues to make good progress in implementing the [Coastal Research, Development and Dissemination \(CoRDDi\) framework](#)<sup>12</sup> developed in 2012. This framework sets out coastal research needs and aims to increase collaboration between research organisations and those responsible for managing flood and coastal erosion risks around the coast. Progress on the framework is reported through a report card. This looks at the type of research being carried out (from basic to implementation in practice), how the research aligns to each of the 4 principal research themes set out within the framework, and how the priority needs identified in the frameworks are being addressed.

The Environment Agency is updating its long-term investment strategy which stakeholders will review over summer 2014. The strategy identifies the impacts that different levels of investment would have on flood and coastal erosion risk in the long term. It forms the context within which the Environment Agency will develop a 6-year capital investment programme.

## 5.2. Enabling others

During the flooding in 2012 to 2013, a major concern raised by farmers was that reduced watercourse maintenance, such as dredging and vegetation clearance, had made flooding worse. Farmers and landowners said that the Environment Agency and Natural England had made it difficult for them to do watercourse maintenance themselves.

In response to this, the Secretary of State asked the Environment Agency to set up a pilot study in October 2013 to:

- involve farmers, landowners, community and environmental groups in maintaining rivers and managing flood risk in their areas
- improve engagement between the Environment Agency, landowners and farmers about maintenance
- reduce 'red tape' to make it easier for farmers and landowners to carry out river maintenance without harming the environment.

In October 2013, 7 river maintenance pilot areas were set up in:

- Alt Crossens, Lancashire
- Winstead Drain, East Ridings of Yorkshire
- River Duckow, Shropshire
- River Idle, Nottinghamshire
- Bottesford Beck, North Lincolnshire
- Upper Thames, Oxfordshire
- River Brue, Somerset

The Environment Agency published a new regulatory position statement (RPS) explaining how landowners in the pilot areas could carry out their own watercourse maintenance without applying for a flood defence consent. Farmers and landowners who wish to dredge rivers to remove silt may now do so simply by notifying the Environment Agency, as long as they meet the requirements of the RPS.

Landowners in all the pilot areas have shown interest in the new arrangements. In the Alt Crossens catchment in Lancashire, 6 landowners have carried out maintenance work including:

- dredging 1.3 km of a river to remove silt
- general watercourse maintenance
- trimming of channel sides
- clearing weeds

At a further 2 locations in the Alt Crossens catchment, the Environment Agency has issued whole farm flood defence consents to landowners who wanted to carry out additional works not within the scope of the RPS. The Environment Agency has worked to support this approach to make it as simple as possible.

As a result of the pilot project, farmers and landowners are also applying to carry out other works, such as repairing bank slips.

The Environment Agency held landowner meetings and drop in sessions in all pilot areas to discuss the study and maintenance approaches. A number of face-to-face meetings and farm walkovers with individual landowners or groups of landowners have also taken place.

Stakeholder groups have been set up in all pilot catchments and involve organisations such as the National Farmers' Union, the Country Land and Business Association (CLA), wildlife trusts, local interest groups, IDBs, Royal Society for the Protection of Birds (RSPB), angling representatives, local councils and landowners.

The Environment Agency reviewed the pilot study in May 2014, identifying changes to include:

- extending the study period until March 2015
- extending the River Idle pilot to include the Isle of Axholme
- introducing 2 new pilot areas in East Lytham, Lancashire and the River Eau in Nottingham

## 5.3. Using technology to inform

### Social media

Over the past year, the Environment Agency has used social media to:

- warn and inform communities at risk of flooding
- build trust with communities through engagement and better customer service
- talk to customers to help raise awareness of the risk of flooding
- gather intelligence to inform operational responses

The number of people and organisations following the Environment Agency on Twitter, Facebook, YouTube, LinkedIn and Flickr continues to increase. During 2013 to 2014, the Environment Agency's social media community grew by:

- 144,000 new Twitter followers (the total is now over 260,000 followers across the Environment Agency's corporate Twitter accounts)
- 9,400 Facebook fans (the total is now over 14,900 fans)
- 14,600 LinkedIn followers (the total is now 26,800 followers)

In November, the Environment Agency became one of the first organisations in the UK to provide Twitter Alerts, a service which pushes alert notifications to subscribers' mobile devices and highlights vital information within Twitter. In January and February, the Environment Agency sent 34 Twitter Alerts to warn of flooding. In total, warning and informing messages sent via Twitter in January and February 2014 resulted in 14,360 retweets and had a potential reach of over 8 million.

### Flood hack

The government set up a 'flood hack' event on 16 February 2014 to use newly available government data to create resources and digital services, such as apps and IT systems to help people affected by flooding. Over 200 people attended the event including developers from companies such as Google, Facebook, and Twitter. The Environment Agency made a range of flood data freely available. Many of the hacks made use of the [Flood Volunteers website](#)<sup>13</sup> which is a database of people willing to assist those in flood-hit areas.

### How Severn Trent Water is reducing sewer flooding

Severn Trent Water has trialled the use of 'ElectroScan' technology in Withybrook, Warwickshire to identify where groundwater is entering the sewerage system. This infiltration reduces the available capacity in sewers and therefore increases the risk of them flooding. Reducing infiltration also provides financial benefits from not having to pump out or treat the water that enters the system.

The company is also using an infiltration tool developed by a UK Water Industry Research project in 2011. The tool identifies which sewers could be susceptible to infiltration using asset information, CCTV survey and flow survey data, and information from infiltration sources such as groundwater levels and soil data. Severn Trent Water is carrying out catchment-wide assessments to identify infiltration causing unduly high inflow at 3 sewage treatment works.

Severn Trent Water has also purchased high resolution LiDAR data to help develop sewer flood risk plans and overland flood risk maps. By using ground data in conjunction with sewer models, staff are now able to understand better the sources and flow routes of sewer flooding.



### Flood identity

Figure 6 Flood identity logo



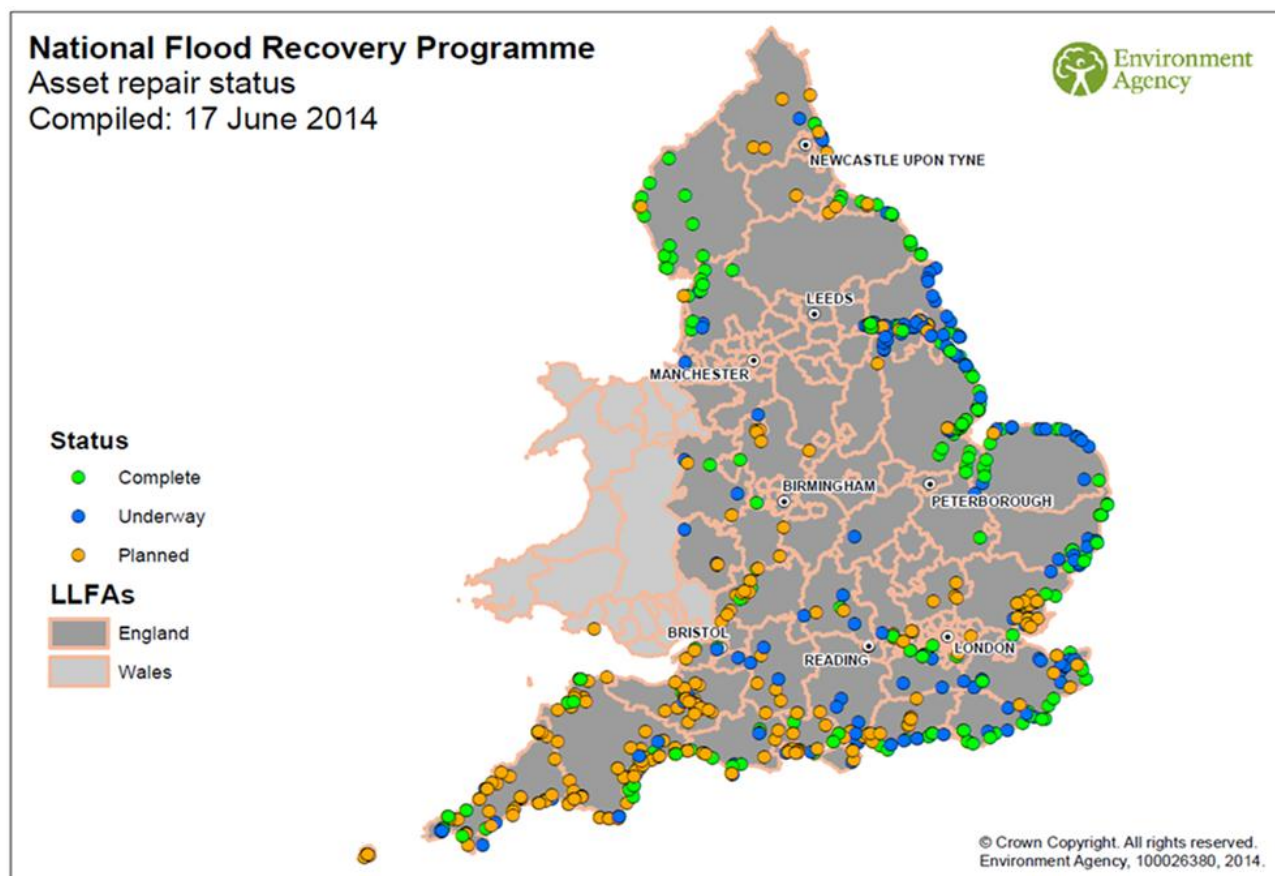
In November 2013 the Environment Agency released a new 'flood identity' as part of a 4-week nationwide campaign to help the public prepare for flooding. The identity was set up by the Environment Agency and other external organisations, groups, communities and individuals. It will help increase the reach and consistency of information about flood risk and the actions people can take to protect themselves from flooding. A range of logos, guidelines and templates were produced for people to download and use on their own flood awareness activities and materials. Currently over 250 people (from about 190 non-commercial organisations) have access to the flood identity materials and over 600 items (logos, guidelines and templates) have been downloaded for use.

## 6. Looking ahead

The series of severe weather events experienced during this year tested our national resilience and preparedness for flooding.

Following the flooding, the priority for all risk management authorities has been their recovery work, making repairs to the flood and coastal assets damaged in the storms. They have already completed some work (shown in Figure 9 below).

**Figure 7 Location of asset repairs completed, in progress and planned**



We know that strong partnership working, sharing information and acting early can help improve community - and therefore national - resilience to extreme weather. However, we also know that the type and severity of an event, and its duration, can affect how - and how well - we respond.

All risk management authorities in areas affected by flooding and coastal erosion are actively reviewing the events of the winter. They are looking at ways to improve their own planning for and response to future extreme weather when it occurs.

During the next 12 months the Environment Agency will update the National Flood Risk Assessment (NaFRA) to update information on the risk of flooding from rivers and the sea. In addition, in September 2014, the Environment Agency will publish draft FRMPs for public consultation, so people can comment directly on the management of flood risk in their communities.

The government remains committed to implementing SuDS at the earliest available opportunity. A statement will be made in the summer which will set out in greater detail plans for implementation. Secondary legislation setting out the implementation date would be expected to be laid in parliament approximately 6 months before that date.

The Environment Agency will also publish its Flood Incident Management (FIM) Plan during the coming year. The plan will describe how risk management authorities will achieve the objectives for managing flood incidents set out in the National FCERM Strategy. The winter flooding provided the opportunity to test some of the principles in the draft plan, and the Environment Agency is now reviewing the plan to incorporate lessons learned from the tidal surge and the floods.

In the 2012 autumn statement, the government allocated an additional £120 million of capital over the 2 years from 2013 to 2015. This funding is to support accelerated construction of over 40 flood risk management schemes, which will protect around 60,000 homes, and are designed to support economic growth.

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- the National Flood Forum
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