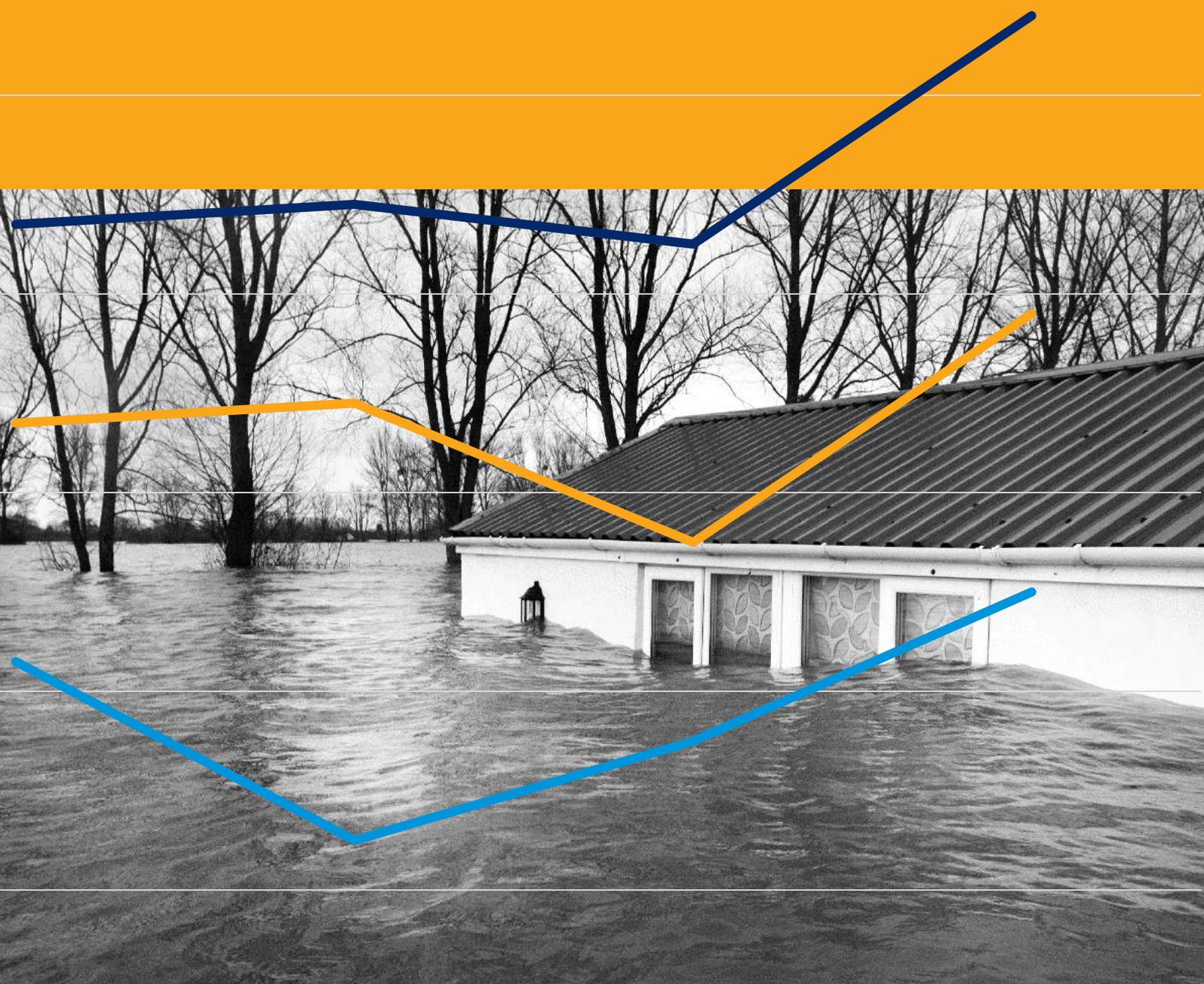


Breaking the Bank?

Funding for flood and coastal erosion
risk management in England



Breaking the Bank?

Funding for flood and coastal erosion risk management in England

www.ciwem.org/floodfunding

Authors

Laura Grant, Policy Adviser

Alastair Chisholm, Head of Policy and Communications

Acknowledgements

Daniel Johns, Committee on Climate Change; Nicole Shamier, Environmental Policy Economist and Jonathan Day, Environment Agency.

Terry Fuller, Tim Palmer, David Thomas, Toby Willis, Marc Pinnell, Katherine Pygott, Graham Lymbery, Fola Ogunyoye, Jack Mason and the CIWEM Rivers and Coastal Group.

CIWEM's Rivers and Coastal Group has strong technical expertise from around 1000 members who come from government organisations and agencies, consultants, contractors, local authorities and the academic community. www.ciwem.org/riversandcoastal

The views expressed do not necessarily represent the view of individual CIWEM members.



CIWEM is the leading independent Chartered professional body for water and environmental professionals, promoting excellence within the sector.

© Copyright March 2015. The Chartered Institution of Water and Environmental Management (CIWEM). 106 to 109 Saffron Hill, Farringdon, London, EC1N 8QS. Tel: 020 7831 3110
Charity Registration No. 1043409 (England & Wales) Registered Charity No. SCo38212 (Scotland)

Cover image: Basket centre by Matilda Temperley
2014 Atkins CIWEM Environmental Photographer of the Year

Contents

| | |
|---|----|
| Executive Summary..... | 4 |
| Recommendations..... | 7 |
| Abbreviations..... | 7 |
| | |
| 1. Context: Managing the risks of flooding and coastal erosion..... | 8 |
| Who is responsible? | 8 |
| Legislative framework | 9 |
| Roles and responsibilities..... | 10 |
| | |
| 2. Current funding framework..... | 13 |
| How are budgets determined? | 13 |
| How is funding allocated?..... | 17 |
| External contributions..... | 22 |
| | |
| 3. Future funding..... | 25 |
| Estimating risk..... | 25 |
| Optimal investment..... | 27 |
| Flood Insurance..... | 30 |
| | |
| 4. Discussion: Are we prepared for the future?..... | 31 |
| Reducing risk..... | 31 |
| Managing residual flood risk | 34 |
| Recommendations..... | 36 |
| | |
| Glossary..... | 37 |
| References..... | 40 |

Executive Summary

Levels of funding

Often shrouded in political spin, much of the debate about flooding is to do with money. Funding can (and generally does) vary with political priorities and reflect prevailing socio-economic trends, leading to conjecture around the scale of funding provision and prioritisation.

Debates as to whether more or less has been spent by the current Government than the last have become highly politicised. It is easy for messages to be put in the wrong context because of the very complex nature of flood funding: the myriad of different organisations and funding routes, all of which support different types of action. The devil really is in the detail.

This report explains and reflects on how much funding has been made available for flooding and coastal erosion risk management (FCERM) in recent years, how funds are prioritised and allocated, and whether future investment plans will reduce flood and coastal erosion risk in the future.

Overall spend

The risk currently faced by flooding and coastal erosion would be considerably higher without the many decades of investment in FCERM. Over the next 50 years without further investment, the overall economic damages would increase by approximately 250 per cent¹.

Overall spend is often used as a barometer to measure government's commitment to FCERM with politicians trying to use the numbers to leverage the best effect. The frameworks in place to collect and redistribute funds have changed considerably in the last five years so it is difficult to compare the absolute levels of funds provided for FCERM between the Coalition and previous Labour Government. The new roles for flood risk management authorities under the *Flood and Water Management Act 2010* were funded in the short term and *partnership funding* was introduced in 2011 to take some of the onus away from central government coffers.

Taking inflation into account, overall central Government spending was slightly higher by the Coalition than the previous Government. Looking beyond face value however, the extra was not for pre-emptive action but a result of additional emergency funds following the winter 2013/14 flood events. Funding in the period was generally in decline and the extra money topped up levels of funding to previous levels. As some of this was used in repair works, the overall level of risk will not have been reduced by as much as if this money was spent on planned preventative FCERM activities to reduce risk.

Priorities

Within the realm of FCERM, funding needs to be prioritised and there are various mechanisms in place to achieve this. Clear priorities have been set for the Environment Agency by successive governments: the top priority is protecting lives; the second is protecting people's homes and people's businesses; and the third is to protect as much agricultural land as is possible. These are reflected in policies that allocate money, which are formulated to provide the best value for money, deliberately protect the most vulnerable and incentivise those that are able to, to increase their resilience.

On balance CIWEM considers that the current priorities for allocating funds for schemes are appropriate and partnership funding has laudable aims to increase the amount of money available by securing local contributions from those who benefit.

However the 2013/14 floods brought into focus the impact of reducing ongoing maintenance spend. The allocation of funding between capital expenditure on new and improved assets and that for regular maintenance spend, forecasting and response is one of debate. Reduced funding in the current spending period has left almost three quarters of flood defence assets not being maintained to their optimum needs in 2014/15².

Future funding

How much needs to be spent in the future

The Government is to be commended for aiming to reduce rather than maintain the current level of risk from flooding and coastal erosion. There are still uncertainties in relation to predicting future risk and expected annual damages. It is important that policies are based on the best and most up to date available evidence and that the government and other agencies are using the best estimates and understand the associated uncertainties.

New work from the Environment Agency quantifies for the first time the impact of future investment on expected annual damage and models the economic optimal spend. The Government's intention is to reduce risk by around five percent by 2021 and reduce expected annual damages by 12 per cent to 2050. This provides the optimum return on investment and beyond this point it becomes increasingly expensive to lower the risk further.

The long term investment scenarios (LTIS) suggest that the optimal profile of investment will be around £750 to £800 million a year in present day costs for the first ten years. The Environment Agency expects this to rise from the 2020s to the 2040s to between £850m and £900m a year. This assumes a medium level of climate change, effective development control and an optimal balance between capital and maintenance spend.

LTIS is a strict economic analysis which does not include local preferences or alternative approaches such as natural flood risk management and sustainable drainage systems which could increase value for money.

Is this achievable?

The current Government's investment plans (and assuming the next Government adopts the same position) aim to meet the long term investment scenarios to 2021. However achieving this level of funding is dependent upon the final agreement of resource funds, whether efficiencies of ten per cent are achieved on the capital programme, and if partnership funds of 15 per cent materialise.

This report considers whether this is achievable.

The budget for capital expenditure has been set for the next six years which should create the potential for significant efficiencies to be made.

Unlike the capital settlement, the Environment Agency's resource budget has not been agreed beyond 2015/16. The investment projections assume that resource funds will continue at their present level. However as not all assets are currently being maintained to their optimal level and may need to be replaced sooner, costs will increase and investment plans may not be delivered. As a result resource budgets may need to be higher than the Government anticipates in the long term.

The plans are set against a backdrop of assumed future public spending cuts. The organisations delivering flood and coastal erosion risk management are already under incredible pressure to cut back on their costs and resources. Future spending reviews will need to take into account that the organisations may be unable to take further budgetary pressure without their functionality being critically undermined.

Additional funding has been made available for Lead Local Flood Authorities to undertake their new roles, however few have a fully formed Local Flood Risk Management Strategy and funding will decline next year on the assumption that these have been completed.

The framework for achieving value for money with investment from partnership funding is appropriate but it is too early to judge its success and it will need time to develop. Tax breaks for businesses that contribute are welcome but other incentives may be needed in the future to encourage further contributions.

Improved awareness and understanding of risk will be a key factor in establishing future funding from partnership sources as well as communicating the benefits of maintenance

activities to secure on-going operation and maintenance funding.

Residual flood risk

In realising the best value for money on investment, not all homes will be secure from flood risk in the future. Achieving the investment plan will move 300,000 properties from a higher risk band to a lower one. However this largely moves properties from a low risk to an even lower one, as this provides the best return on investment. The number of properties at high flood risk is expected to rise in the future which will have implications to householders from the direct impact of flooding and the impact on property prices and affordable insurance.

Effective development control is assumed in the long term investment scenarios, however if development in the floodplain were to follow projected rates of population growth as suggested by the Office for National

Statistics, a further 16 per cent is added to the cost of optimal flood protection compared with the 'baseline' scenario³. Even with flood related development policies in place, around 22,000 new properties were built in the floodplain per year over the decade to 2011⁴. This highlights the importance of effective development control and the need for completed local flood risk management strategies.

The Flood Re insurance scheme aims to keep insurance affordable for the next 25 years for those at high risk. However as it is currently formulated it is poor value for money and does not provide the right incentives. It keeps house prices in the floodplain artificially high and has not yet made clear how it will help people to reduce their own risk to flooding, instead it postpones the problem. Clear communications on flood risk are needed to communities at risk and those receiving financial assistance.

Recommendations

- ◆ Future governments should fund flood and coastal erosion risk management at a level which meets the ambition agreed in the Environment Agency’s long term investment scenarios and reflects the latest understanding of risk.
- ◆ Defra should work with Infrastructure UK within HM Treasury to commit to funding a maintenance and support programme for flood and coastal erosion risk management to match the current six-year plan for capital works. Continuity and confidence in funding is essential to stimulate the supply chain to achieve the efficiencies necessary to deliver Defra’s investment plan.
- ◆ Local flood risk management strategies should be completed by all Lead Local Flood Authorities as a matter of priority to provide the business case to influence funding allocation and implement their action plan. Strategies will also assist in identifying cost effective early actions to reduce flood risk and resolve how to communicate with the public, raise awareness and encourage local leadership.
- ◆ Effective development control will considerably lower the costs of future flood and coastal erosion risk management. Local planning authorities must be robust in their approach to this.
- ◆ Policies or funding streams should not incentivise building in the floodplain unless effective mitigation and resilience measures are included and the development in question is appropriate for its location.
- ◆ The progress of partnership funding should be monitored and reported on annually by Defra to show how effectively it is growing and whether there is a need for any further intervention.
- ◆ Defra should ensure that Flood Re, the transitional flood reinsurance scheme, has an explicit aim to build awareness of risk with those receiving assistance. It must incentivise owners to implement property level protection to increase their flood resilience so that they are insurable once the scheme ends.

Abbreviations

| | | | |
|-------|---|-------|--|
| CIL | Community Infrastructure Levy | IDB | Internal Drainage Board |
| DCLG | Department of Communities and Local Government | LLFAs | Lead Local Flood Authorities |
| Defra | Department of Environment, Food and Rural Affairs | LTIS | Long term investment scenarios (Environment Agency 2014) |
| EA | Environment Agency | NaFRA | National Flood Risk Assessment |
| EAD | Expected Annual Damage | NRW | Natural Resources Wales |
| FCERM | Flood and Coastal Erosion Risk Management | OM | Outcome measure (1-6) |
| FWMA | Flood and Water Management Act 2010 | RFCC | Regional Flood and Coastal Committees |
| GiA | Grant-in-Aid | SAMP | System asset management plan |

A Glossary of terms is available on [page 37](#).

1. Context: Managing the risks of flooding and coastal erosion

Who is responsible?

The UK received record-breaking rainfall in 2012, 2013 and 2014⁵ leading to a series of flood events, which were devastating to individuals and communities. Currently more than one in six (5.5 million) properties in England and Wales are at risk of flooding from all sources of water⁶. In the future it is very likely that extreme precipitation events will become more intense and frequent and an increase in development and other pressures on land use could add to flood risk. Failure to manage the risks of flooding and coastal erosion in a sustainable way will lead to continued loss of life and property, extensive damage to the UK economy and ongoing misery for millions of people.

During the winter of 2013/14 over 7,800 homes and nearly 3,000 commercial properties were flooded⁷, the railway line between Exeter and Cornwall was destroyed and one of the UK's busiest ports was closed for days⁸. Whilst the outcome would have been far worse without flood risk management measures, the public outcry indicated a dissatisfaction with the Government's current approach.

Much of the debate about flooding is to do with money and is therefore often subject to political spin. Whether this is described as funding, spending or investment is immaterial, someone somewhere has to pay for it. In 2014 a Parliamentary Committee established that spending on flood defences has not kept pace with rising risks from more frequent severe weather and that existing defences are not being maintained adequately⁹.

The benefits of investing in flood and coastal erosion risk management outweigh the costs of their impacts many times over but there can be a debate as to who should provide the funding. Should the cost be distributed across society or should those at greater risk contribute more?

The Government is under no legal duty to provide flood risk management or provide protection to a certain standard. It is however under increasing pressure to adequately manage flood risk for both the societal and economic costs it can cause. Since the majority of funding is provided by the Government, every taxpayer pays towards flood risk management under the current arrangements.

The approach in the UK is often compared to the Netherlands, where there is a legal commitment to flood safety standards. The UK's hydrology and geology is far more complex so it is comparably more expensive to lower flood risk. In the Netherlands there is a lot more political and public support for FCERM measures and this may be because two thirds of the land area is at risk, compared to around 15 per cent in the UK¹⁰.

Flood risk management measures make many riverside and coastal areas economically viable to work and live in, particularly where residents could not afford to pay for protection from flood risk if Grant in Aid was removed. Subsidising riverside and coastal areas enables such communities to prosper as without it, retreat would be a long term option that communities would have to seriously consider.

It may be argued that if you live in a floodplain you do so at your own risk, so as a beneficiary, you should contribute more towards FCERM. A form of flood tax to reflect this was proposed in 2002 but quickly shelved due to a hostile reaction from communities at flood risk. Many homeowners have unknowingly bought property in flood risk areas, and did not take account of the potential for flood losses or higher insurance bills in the price that was paid. People whose homes have been flooded in the past or who live in flood-prone areas can find it more difficult than others to access affordable insurance, and for those that have been flooded, the trauma can last for months and years.

Paying a further tax may not cause any decrease in insurance rates and it would be difficult to demark where a tax should fall; flood maps may be too inaccurate and flooding does not just impact those in the floodplain. Others too can still derive benefits from the management of these areas.

Since river and coastal flood protection has been managed in the main through public funding for many decades, many would not be aware of the potential for government to start to retreat from funding flood and coastal erosion risk management at the level to which society has become accustomed. Is there an equitable solution to balance the local needs of at risk communities with those of the country as a whole?

In recent decades responsibility for flood and coastal erosion risk management has moved from a system of local choice and local funding (prior to 2004), to one of national funding to meet national priorities (up to 2011), to one that is now based on both national and local funding and more local choice (the partnership funding era from 2012).

There is still some confusion in the general public and media as to how the new funding framework operates. This report aims to provide some clarity as to where responsibilities lie and how flood and coastal erosion risk management is arranged. It analyses recent expenditure and whether the current Government's investment plans will deliver on its aims for reducing risk and managing residual flood risk in the future.

Legislative framework

Flood and Coastal Erosion Risk Management (FCERM) is a devolved matter for each administration in the UK. In England responsibility rests with Defra. Pages 13 and 14 outline the differences of approach in Scotland, Wales and Northern Ireland for information and context. Wales falls under

much of the same legislation as England but has a different approach to funding and has different organisations to fulfil the roles and responsibilities.

Evolution of FCERM legislation

A Royal Commission report in 1927 set the basis for the *Land Drainage Act 1930* and the tone for the legislation today. There were two fundamental ideas: an overall authority responsible for the main rivers in each of the catchment areas to work closely with drainage authorities, and funding for drainage work should be levied over a much wider area, across the catchment. For the first time funding was not restricted solely to those whose land or property would be flooded without the work of the authority. This established national and local cost sharing, a catchment focus and increased local authority involvement in the process¹¹.

FCERM has evolved in a piecemeal way, often after major flood events, and follows no single statutory regime. Since the 1930s various Acts of Parliament and amendments have allocated the responsibilities and powers for land drainage and flood defence in England and Wales. The *Land Drainage Act 1991* and the *Water Resources Act 1991* are a consolidation of previous Acts and provide the guidance and powers. National legislation also sits within the framework of European Directives (for example, the Water Framework Directive, Floods Directive, Birds Directive and Habitats Directive).

In 2008 the Pitt Review¹² identified a lack of clarity in roles and responsibilities as a result of the way legislation has evolved. It recommended that the Environment Agency should progressively take on a national overview of all flood risk, including surface water and groundwater flood risk and that there should be a similar role in Wales to Welsh Ministers. In England and Wales the *Flood and Water Management Act 2010* attempted to clarify the multiagency approach. It gave a new responsibility to the Environment Agency for developing a National Flood and Coastal Risk Management Strategy, and a new responsibility to local authorities, as Lead Local Flood Authorities, to co-ordinate flood risk management in their area. It also aims to achieve greater resilience to climate change and deliver wider policy objectives for biodiversity, soil quality and the natural environment. Most recently the *Water Act 2014* introduced new arrangements for flood risk insurance, known as Flood Re and amended rules to encourage the take up of sustainable drainage systems.

¹ For example, *Land Drainage Act 1930, 1991, 1994. Environment Act 1995. Water Resources Act 1963,*

1991. Water Industry Act 1991, Water Act 2003, 2014. Flood and Water Management Act 2010.

Powers

In England and Wales the powers relating to flooding and land drainage remain *permissive*. This means that the bodies involved do not have a legal duty to actually take action.

Types of powers

- ◆ Mandatory – legal duties that must be met e.g. primary and secondary education.
- ◆ Permissive – powers that can be exercised but there is no requirement to do so e.g. manage flood risk.
- ◆ Discretionary – specific projects or groups may be allocated funds.

The powers do not confer:

- ◆ Any right to protection from flooding or coastal erosion.
- ◆ Any right to any particular standard of protection where defences are provided¹³.

The powers recognise that flooding and coastal erosion cannot be entirely prevented and reduces public liability, for example, avoiding the Government having to pay compensation for losses following each flood. Often after a major flood event there is a misconception that the Government should have provided flood protection, whereas in reality it is landowners who have the primary responsibility for flood prevention. This is different to other areas of government funded activity, for example, in education there is a legal duty for the providers (education authority) to educate every school age child. In the health service there is a requirement that based on clinical need, treatment is free at the point of delivery¹⁴. This means the provision is determined by need, rather than being determined by both need and budget, as is the case with flooding.

There are however a few instances in the legislation that do create a mandatory requirement for management, for example:

- ◆ Riparian owners (those who own land or property adjacent to rivers or other watercourses) have a mix of common law rights and statutory responsibilitiesⁱⁱ. They are responsible for maintaining the bed and banks of the watercourse and the trees and shrubs growing on the banks to avoid obstruction and not increase flood risk.
- ◆ The European Habitats Regulations¹⁵ create a requirement for protection of internationally designated sites from inappropriate or damaging inundation.
- ◆ “Awarded” watercourses which are the responsibility of the local District Council or another relevant authority.

Roles and responsibilities

The *Flood and Water Management Act 2010* and the National FCERM Strategy for England¹⁶ describe the updated roles of each flood risk management authority and how they need to interact with their partners:

- ◆ The Department of Environment Food and Rural Affairs (Defra) has policy responsibility for FCERM.
- ◆ The Department for Communities and Local Government (DCLG) is responsible for planning policy, including policy affecting the development of land which is at risk from flooding or coastal erosion.
- ◆ The Environment Agency (EA) has a strategic overview of all sources of flooding. It has permissive powers to carry out flood and coastal erosion risk management work and to regulate the actions of other flood risk management authorities on main rivers (generally larger rivers) and the coast.
- ◆ The Environment Agency sets up Regional Flood and Coastal Committees (RFCCs) to direct flood risk management decisions in each region. They oversee both Grant-in-Aid and the Local Levy and consent to

ⁱⁱ For further information on Riparian Owners responsibilities see the Government’s guidance [Living on the Edge](#)

how this money is allocated for spending by the Environment Agency, Internal Drainage Board or local authority. RFCCs are comprised of members of the Environment Agency, the Lead Local Flood Authorities and independent members with relevant experience.

- ◆ Lead Local Flood Authorities (LLFAs) (Upper-tier local authorities i.e. unitary and county councils) have responsibility for local flood risk management from surface water, watercourses that are not main rivers and groundwater and for local engagement and partnership working. LLFAs must set out how local flood risk will be managed in their area in a local flood risk management strategy. LLFAs feed into the programme approved by RFCCs. District councils have powers to manage flooding from certain watercourses.
- ◆ Internal Drainage Boards have a role in managing local ordinary water courses within their Districts (a number of low-lying areas covering around ten per cent of England) and in some upland areas where land is at increased flood risk¹⁷. There is a move to pass on the management of some lengths of main rivers to IDBs where it is logical that the IDBs can be more effective at delivery.
- ◆ Local authorities, through application of the National Planning Policy Framework¹⁸, can restrict development in flood risk areas.
- ◆ Water and sewerage companies have a duty to 'effectually drain' their areas of responsibility. They are also responsible for public sewers and to resolve sewer flooding affecting properties¹⁹.
- ◆ Coastal erosion is managed by Coastal Erosion Risk Management Authorities, which are comprised of representatives from the Environment Agency and local authorities.
- ◆ In London there is a statutory obligation within the *Metropolis Management (Thames River Prevention of Floods) Amendment Act 1879*²⁰ for riparian owners.
- ◆ Landowners are responsible for maintaining culverts on their land.
- ◆ Reservoir owners are responsible for prevention of downstream flooding due to overtopping or breach of the reservoir.

Scotland

The *Flood Prevention (Scotland) Act 1961* gave local authorities discretionary powers to make and build flood prevention schemes. Guidance for local authorities on appraisal of economic, environmental and social impacts of flood protection schemes under the *Flood Risk Management (Scotland) Act 2009*²¹.

In the National Flood Risk Assessment, the Scottish Environmental Protection Agency (SEPA) identified 14 geographical areas across Scotland, called Local Plan Districts, which include whole river catchments and cross local authority boundaries. Flood Risk Management Planning, and partnership working to support this, will take place for each Local Plan District in Scotland.

In Scotland the existing funding programme provides 80 per cent of funding to capital

schemes of over two million pounds. This excludes maintenance which the Local Authorities will be responsible for. This approach is effective for the large capital schemes that provide significant direct economic benefits through protecting people and property. However, it fails to address protection for the communities affected by flooding on a regular basis that do meet the economic requirements. Financial support is also needed for local communities to help them build up community resilience.

A more equitable programme for funding flood and coastal risk management is being developed in Scotland in-line with the development of the Strategies and Plans. A new mechanism to facilitate this is due to be announced in 2015.

Wales

There is a separate national FCERM policy for Wales, set out in the Welsh Government *National Strategy for Flood and Coastal Erosion Risk Management* published in April 2012.

In April 2013 Natural Resources Wales took over the functions of Environment Agency Wales. Since then the remit of key organisations mentioned elsewhere, particularly the Environment Agency and Defra, do not include Wales. However guidance issued by the latter for project appraisal is still used to assess options, determine cost benefit ratios and justify a preferred option.

The Welsh Government did not adopt the Defra/Environment Agency position on partnership funding, even before Environment Agency Wales became Natural Resources Wales. This was because of a perception that poorer communities might be unfairly disadvantaged. Outcome Measures also do not apply in Wales. Measures to manage

flood risk are implemented across all communities regardless of income levels if the benefit cost ratio is greater than unity. Prioritisation is currently based on the level of flood risk determined from flood risk mapping and recorded in the Communities at Risk register.

Development of an updated national funding policy and prioritisation methodology is ongoing. The majority of funding for FCERM in Wales is via Welsh Government Grant in Aid to Natural Resources Wales and Lead Local Flood Authorities. Other Welsh Government administered sources include the Wales Infrastructure Investment Plan (WIIP) and the European Regional Development Fund (ERDF).

The functions, assets and staff of the Internal Drainage Boards in Wales will be transferred to Natural Resources Wales in April 2015. In addition Dwr Cymru Welsh Water invests a proportion of its asset management programme to reduce the risk of sewer flooding to properties.

Northern Ireland

Flooding and coastal erosion has been historically less severe and infrequent in Northern Ireland than in England and Wales. Currently 1 in 18 properties are at risk from flooding from rivers or the sea. In 2013/14 some six million pounds will be spent on flood defence schemes.

Government administrative arrangements for FCERM in Northern Ireland operate in the absence of any statutory provision for coastal erosion, as well as without formal or strategic shoreline management planning and any integrated flood and coastal erosion risk management policy.

There is legislation for *The Water Environment (Floods Directive) Regulations (Northern Ireland) 2009*²² which implement the EU Flood Directive and *The Drainage (Amendment) (Northern Ireland) Order 2005*.

Flood risk management and drainage functions are delivered by the Rivers Agency, Division of the Department of Agriculture and Rural Development. It is the statutory drainage and flood defence authority for Northern Ireland. The Rivers Agency has a dedicated unit which provides advice to the Department for Environment, Planning NI, on all drainage and flood related matters in regard to proposed development.

2. Current funding framework

How are budgets determined?

In England and Wales the primary funder of FCERM is the Government through national taxation. Wales receives funding for all services including FCERM from a block grant to the Welsh Government so the following figures refer to England only.

The Government determines funding²³:

- ◆ In accordance with the Comprehensive Spending Reviewⁱⁱⁱ
- ◆ Informed by the Environment Agency's Long Term Investment Scenarios^{iv,24}

As a result funding can (and generally does) vary with political priorities and reflect prevailing socio-economic factors, leading to large amounts of conjecture as to whether enough funding is being provided and what is being prioritised. [Figure 2.1](#) shows central Government funding over the last ten years and compares it to real terms from 2014/15 prices. This includes the additional funds for repairs following the winter floods 2013/14 which explains the substantial increase in 2014/15 against a backdrop of lower expenditure within the five year period.

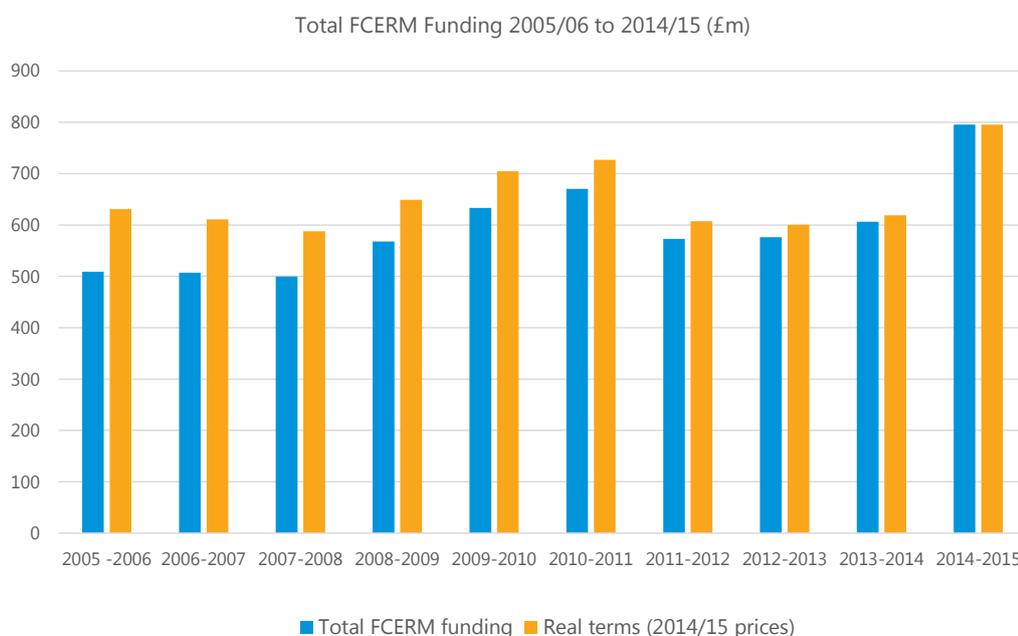


Figure 2.1 Total central Government FCERM funding 2005/06 to 2014/15 in England. Defra²⁵

Note: Real terms figures are shown in 14/15 prices, using HM Treasury's GDP Deflator.

ⁱⁱⁱ Comprehensive spending reviews are used to set the maximum amount government departments can spend over a set period of time. These are usually three year periods to bring more certainty to long-term planning. The Autumn Statement in

December outlines economic projections and broad departmental spending allocation annually.

^{iv} This was updated in December 2014 to reflect the latest scientific evidence of changing risk and optimum investment levels. See more in chapter 3.

Figure 2.2 shows the different flood and coastal erosion risk management authorities and the flow of different funding streams. Figure 2.3 (overleaf) shows how much funding each flood risk management authority provides.

The majority of funding is given as FCERM Grant in Aid from Defra to the Environment Agency. This is used to fund flood warnings, build new and improved flood and coastal defences, maintain existing structures and respond to flood incidents. Defra also retains some core funding for schemes such as Community Pathfinder projects.

To fund their duties under the FWMA (such as producing a local flood risk strategy) LLFAs receive funding from DCLG and Defra. Since 2013 the DCLG component is paid through the overall Settlement Funding Assessment (SFA) for local authorities. The Defra component is paid via the DCLG Local Service Support Grant (LSSG)²⁶.

Regional Flood and Coastal Committees (RFCCs) raise in the order of £30m per year

funding through the Local Levy for flood management schemes to fund FCERM activities within its region that are a local priority²⁷. LLFAs contribute to the local levy fund and are compensated to some extent by the LSSG which is a general grant allocated directly to local authorities as additional revenue funding to areas²⁸.

Other income includes the Environment Agency's power to levy a General Drainage Charge²⁹ to occupiers of agricultural land that is not within an Internal Drainage Board district^v.

Partnership funding was introduced in 2011 to encourage external sources of funding. Further details on external contributions follow later in the chapter.

Local authorities can also use their general funding provided by DCLG to pay for other flood and coastal erosion management and drainage activity, for example for the maintenance of ordinary watercourses.

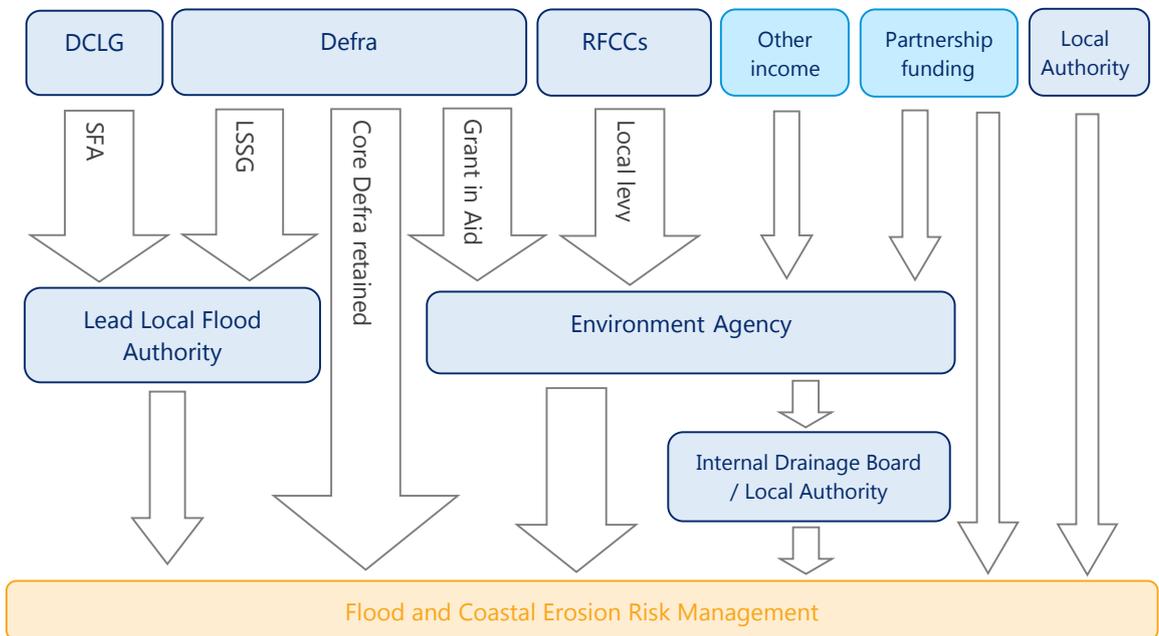


Figure 2.2 FCERM Funding authorities. Adapted from Defra, 2015³⁰

^v The General Drainage Charge contributes to additional maintenance that would not have been

affordable with national funding alone. It only applies to Environment Agency Anglian region.

Funding for flood risk management in England 2005/06 - 2014/15 (£m)

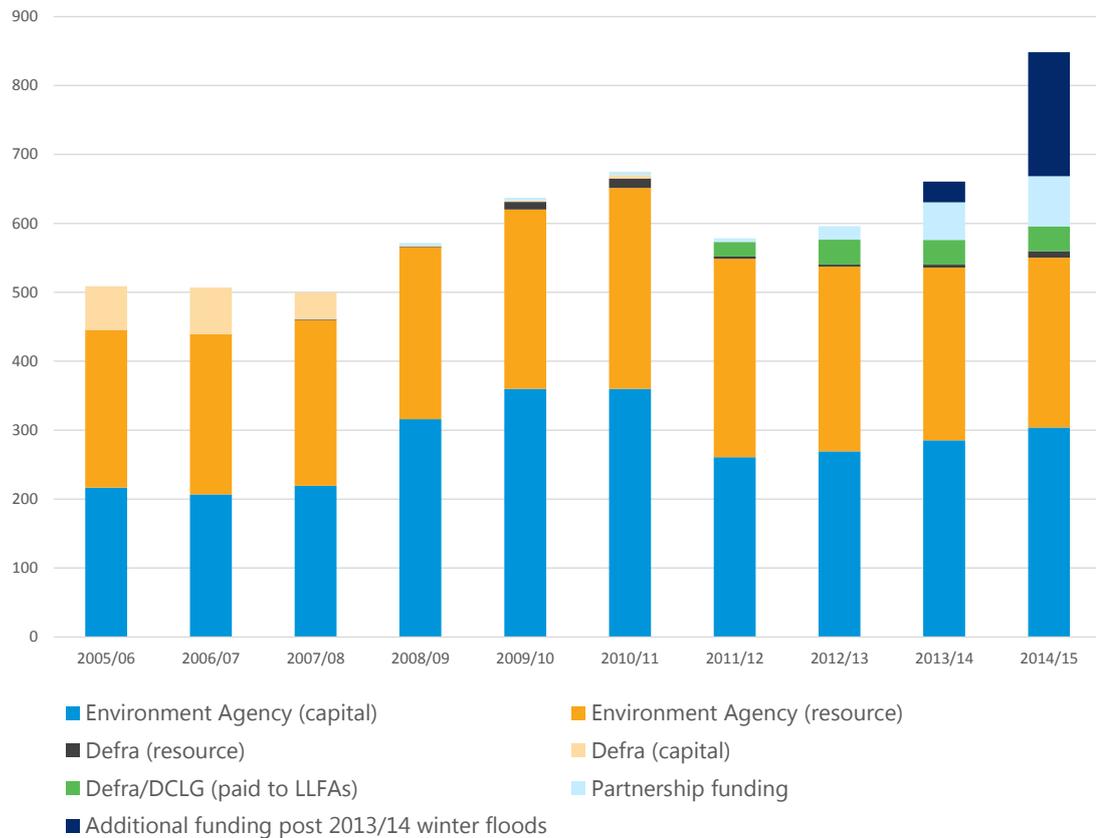


Figure 2.3 Funding for flood risk management in England 2005/06 to 2014/15.

Figures do not account for inflation. Data from Defra³¹ and the Committee on Climate Change³².

Environment Agency (capital) is Grant in Aid from Defra paid as a block grant to the Environment Agency which it spends directly on FCERM, but also passes some on as grants to Local Authorities or Internal Drainage Boards

Environment Agency (resource) is Grant in Aid from Defra (also referred to as revenue) to the Environment Agency for work such as routine maintenance of flood defences, emergency planning and response, forecasting and warning services, and other running costs.

Defra (resource and capital) – Core funding for schemes such as the Community Pathfinder projects.

Defra/DCLG (paid to LLFAs) - From 2011/12, funding was provided from Defra to lead local flood authorities to support their new roles under the *Flood and Water Management Act 2010*. In 2013 a proportion of this funding was paid by DCLG. In 2013 LLFAs have therefore received part of this funding from Defra (£15m) and part of this funding from DCLG (£20.7m).

Local Authority expenditure including local levy sums are not included in the overall total as there will be double counting. Defra grants to LLFAs are intended to fund local authority net current expenditure.

External funds from Partnership funding are now confirmed: 2011/12 - £5.4m; 2012/13 - £19.6m; 2013/14 - £54.5m; 2014/15 - £60.5m

On February 6th 2014 an additional £130m for emergency repairs and maintenance was announced, £30m in 2014 and £100m in 2015. The Budget on 19th March 2014 announced £80m for 2014/15 and a further £60m for 2015/16. In 2014/15 the Environment Agency resource and capital figures take into account an estimated budget switch, whereby an additional one-off £100m was given to Environment Agency as resource, but of which an estimated £65m will be switched to and spent as capital during the year.

There has been much debate as to whether funding has increased or not under the present Government. It is difficult to compare the two periods as the new roles under the *Flood and Water Management Act 2010* were funded in the short term, partnership funding was introduced in 2011 and emergency relief funds were needed after the 2013/14 winter floods.

As [figure 2.3](#) shows, under the previous Government expenditure steadily rose from 2005/06 to 2010/11. Following the election of the Coalition Government in May 2010, spending on flood risk management from central Government was reduced. In the 2010 Comprehensive Spending Review (2011/12 to 2014/15), a total of £2.17 billion in central Government funding was provided for FCERM. The National Audit Office suggests this represents a *“six per cent fall in central government funding”*³³.

Since then Defra has confirmed that external funding from partnership funding will total up to £140m to the end of the period in 2014/15³⁴. And an additional £130m for emergency repairs and maintenance was announced following the 2013/14 winter floods. The 2014 Budget also included £80m for 2014/15 and a further £60m for 2015/16.

If the additional funding for emergency relief and Partnership funds are added to the budgeted figures, total funding for FCERM in the current spending period will be similar to that in the last spending period in real terms³⁵.

New expenditure figures³⁶ show that within the five year period 2005/06 to 2009/10 a total of £2716.1m was spent by central Government compared to the most recent five year period 2010/11 to 2014/15 where a total of £3220.8m has been provided. If real term figures for 2014/15 are used then the previous Government spent £3182.6m and the Coalition Government spent £3348.3m.

However there are a number of points worth noting:

- ◆ Whilst the trajectory of funding looks set to rise in the future ([figure 2.1](#)), much of the additional funding has been allocated for emergency response and recovery from recent events, it is a one off payment and brings funding closer to the total of the previous period^{vi}. This money cannot be considered as being used for reducing risk further as it has been used to bring defences back to their required condition after they were damaged. Further discussion on future funding is in Chapter 3.
- ◆ ‘Additional’ funding announcements may include money that has been re-allocated from within an existing Defra budget. The Environment Food and Rural Affairs Committee has recommended that if funding is re-allocated from within an existing budget, *“Defra must ensure that the process is completely transparent and provide a clear and detailed accompanying explanation which sets out what activities are receiving less funding as a result”*³⁷.
- ◆ The figures include £129m being provided to local authorities between 2011/12 and 2014/15 in the form of retained business rates, revenue support grant and direct grants from Defra³⁸. However it is not ring fenced for specific services, so councils can decide how they wish to use it and it will always compete with other local priorities. The additional money is to fund their new roles under the *Flood and Water Management Act* which made it compulsory for Lead Local Flood Authorities to prepare a local flood risk management strategy. As of March 2014, only 24 out of 152 LLFAs had finalised a local flood strategy, with a further 34 out for public consultation³⁹. From 2015/16 grants to LLFAs will be reduced by £5m to reflect that this work should have been completed.
- ◆ Not included in the figures is the ‘Repair and Renew’ capital grant set up by Defra

^{vi} The new LTIS assumes that the emergency and repairs funding has been used to bring defences back to the condition they were in pre 2013/14.

to fund flood resilience and/or resistance measures for homes and businesses that had been flooded between April 2013 and March 2014, to the value of up to £5,000 per property.

How is funding allocated?

Investment in FCERM is split between capital and resource. Capital funding is primarily for the construction of new, improved or refurbished assets and resource funding covers a wide range of activities including maintenance, flood mapping and staff costs. In 2013/14, the figure for capital spend was just under £294m whilst resource spend was around £280m⁴⁰.

There have been many debates over the allocation of funding to capital and maintenance projects⁴¹. A balance needs to be achieved between the need for ongoing attention (revenue expenditure) with longer-term repairs, refurbishment and renewal (capital expenditure).

In 2013 Defra was successful at securing the first six year budget (from 2015/16 up to 2020/21) for capital FCERM infrastructure totalling £2320m⁴². The amount will vary each year (as shown by the profile of [figure 2.3](#)) as the HM Treasury has allowed flexibility for more effective delivery⁴³. £60m is being brought forward in the capital programme to deliver early benefit, with annual investment levels from 2016/17 to 2018/19 £20 million higher, and the two subsequent years £30 million lower. The certainty of a six year budget is positive as it will allow much greater efficiencies to be made in the delivery of schemes.

Resource or revenue expenditure includes routine maintenance of flood defences, moving obstructions and sediments from watercourses and preventative operations such as weed and vegetation trimming. Largely ignored in some discussions, it also includes flood mapping, modelling, warning

and awareness, emergency planning and response and staff, offices and advice on spatial planning and other running costs⁴⁴. It is decided annually and beyond 2016/17 it is yet to be agreed.

Grant in Aid for capital schemes

Funding is granted from Defra to the Environment Agency which is responsible for distributing funds to high priority investments. The allocation of funds is dependent on the public benefit it provides, such as reducing flood risk to households, businesses and infrastructure. Each spending review requires targets or 'outcome measures' to be agreed between the Government and the Environment Agency, such as the number of homes to be protected by installing new flood defences or for environmental improvements.

The [partnership funding calculator tool](#) and guidance note: [calculate grant in aid funding for FCERM projects](#) determine how much GiA funding a project is eligible to apply for. Schemes are scored based on outcome measures and value against investment, the score that any scheme can achieve is increased if partnership investment (often through local councils or IDBs) can be sourced, strengthening its business case. The highest scoring schemes will be first in line to receive funding to ensure the maximum benefit is achieved with every pound of taxpayers' money⁴⁵.

For GiA to be awarded, flood risk and coastal erosion management schemes must be approved by the Environment Agency on behalf of Defra, and be accepted onto the Medium Term Plan^{vii}. This plan indicates whether GiA is sought and provides the key information needed for the Environment Agency to assess what, if any, level of GiA support is possible. The Environment Agency oversees the process of allocating funding and works with its Regional Flood and Coastal Committees to agree the final details of the programme⁴⁶. RFCCs have the discretion to change the order of delivery and fund lower

^{vii} LLFAs and other risk management authorities are required to submit an annual plan, referred to as

the Medium Term Plan (MTP), to the Environment Agency.

scoring schemes if there is there is justification.

Once a scheme has funding allocated, a full business plan is developed and scrutinised by the Environment Agency. This includes option appraisal, environmental and other considerations and a full detailed costing. This two-step process allows for outline planning leading to scheme delivery limiting inappropriate spending and avoiding inappropriate solutions to environmental or flood risk problems. Efforts are currently being made to streamline this process and ensure that the level of scrutiny is proportionate to the level of investment being made to avoid financial waste.

The partnership funding calculator takes into account long-term maintenance costs as part of a project's whole-life costs during economic appraisal. However this is not then allocated into a future maintenance budget but will be subject to the Environment Agency's System Asset Management Plan (SAMP) process (see asset maintenance and other preventative works).

Priorities

Clear priorities have been set for the Environment Agency by successive governments: the top priority is protecting lives; the second is protecting people's homes and people's businesses; and the third is to protect as much agricultural land as is possible. These are reflected in the outcome measures which enable limited funding to be prioritised (table 2.1 overleaf). They are formulated to deliberately protect the most vulnerable and incentivise those that are able to increase their resilience to do so.

Outcome measures are effectively key performance indicators that the Environment Agency use to report back to Defra and the HM Treasury against annual targets. This drives the implementation of policy and informs decisions when making business cases for investment. The principles behind

outcome measures remain the same but the absolute targets for each outcome measure are reviewed from time to time, typically after spending review periods lasting three or four years. This helps to reflect socio-economic circumstances prevalent at the time.

In addition to those in table 2.1 there are outcome measures OM5 and OM6 which measure the performance of the Environment Agency in general but are not included in the project calculation of GiA⁴⁷. OM5 is the proportion of households and businesses in highest risk areas that receive the Floodline Warnings Direct service and OM6 is the proportion of residential units within planning decisions where the application has been refused or has been amended in line with Environment Agency advice. Benefits to the agricultural sector, roads and other infrastructure are included in OM1 and benefits to non-specialist businesses are not included.

People and property

Often a person's largest financial investment is their home and due to the risk to life and the trauma of being flooded it is understandable that this is where funding is largely prioritised. Deprived communities are disproportionately affected by high levels of flood risk, particularly in urban areas and along the coast^{48,49}. The Government's policy is to help deprived communities as they generally have a lower capacity to prepare, respond and recover from flood events. Extra funding is allocated through an outcome measure score where two and a half times more money per residential property is allocated for those in the 20 per cent most deprived communities compared to the 60 per cent least deprived^{viii}. The Joseph Rowntree Foundation has developed a range of resources to identify vulnerable communities in relation to flooding and help with the delivery of equitable responses to climate change at the local level⁵⁰.

^{viii} Levels of deprivation are assessed using the existing Index of Multiple Deprivation, commissioned by DCLG.

| Economic benefits | |
|----------------------------|---|
| OM1 | The average benefit cost ratio across the capital programme based upon the present value whole life costs and benefits of projects delivering in the Government spending review period. Individual projects will need to estimate and report Present Value Benefits and Present Value Costs. |
| Households at flood risk | |
| OM2 | Number of households moved out of any flood probability category to a lower category |
| OM2b | Number of households for which the probability of flooding or coastal erosion is reduced from the very significant or significant category to the moderate or low category. |
| OM2c | Number of households in the 20 per cent most deprived areas moved from the very significant or significant flood probability category to the moderate or low category. |
| Households at erosion risk | |
| OM3 | Number of households better protected from coastal erosion. |
| OM3b | Number of households protected against loss in 20 years from coastal erosion. |
| OM3c | Number of households in the 20 per cent most deprived areas protected against loss in 20 years from coastal erosion. |
| Water dependent habitat | |
| OM4a | Hectares of water dependent habitat created or improved to help meet the objectives of the Water Framework Directive. |
| Intertidal habitat | |
| OM4b | Hectares of intertidal habitat created to help meet the objectives of the Water Framework Directive for areas protected under the EU Habitats/Birds Directive. |
| Protected Rivers | |
| OM4c | Kilometres of rivers protected under the EU Habitats/Birds Directive improved to help meet the objectives of the Water Framework Directive. |

Table 2.1. Outcome Measures for the 2010 Spending Review period. [Environment Agency](#)⁵¹

Agricultural land

Capital projects completed during 2011/12 provided an improved level of flood protection to more than 74,000 hectares of agricultural land⁵². The economic benefits of protecting farmland are included in OM1. Under this measure, Defra also tracks the present value of whole-life benefits of the Government's investment in FCERM capital projects. These benefits include damages avoided to agricultural land, crops and productivity, together with impacts on infrastructure and other assets which play a role in growing food and making it available to customers.

The comparative value of property versus land per square metre makes farmland more of a

challenge to protect. For instance, a single house valued at £200k might only need 10 or 20 metres of flood embankment to protect it. Yet the same value of farmland could be 12 hectares and likely to need at least 300m of flood embankment. It has been a conscious decision to value agricultural land lower than people and property within the outcome measures as agricultural land is run as a business and can change crops and land use to reflect the risk of inundation.

There are options through the reform of the EU's Common Agricultural Policy (CAP)^{ix} for farmers to adopt flood resilient agriculture and contribute to natural flood risk management measures as beneficiaries. New CAP schemes are being implemented in 2015 and FCERM priorities have been considered as part of the Countryside Stewardship scheme^x. This includes targeting work and allocating part of the budget to deliver water, biodiversity and flood risk in synergy. More detail about the scheme and these options will be announced in 2015⁵³.

Road, rail and critical infrastructure

Over half of water and sewage pumping stations/treatment works, one fifth of railways, ten per cent of major roads, 14 per cent of electricity and a quarter of gas infrastructure is located in areas at risk of flooding⁵⁴. The rail damages in Somerset in 2013/14 were higher than any other category at approximately £17m.

Many have questioned the lack of an outcome measure for critical infrastructure. However the benefit cost ratio is influenced by all economic benefit, as calculated in the Multi Coloured Manual^{ixi55}, and this does therefore take critical infrastructure into account. Yet the costs, for example of a road being flooded, are relatively low as they are calculated by the increased time of travel for passengers due to the diversion. A road therefore needs to be very busy, have a long diversion, and flood frequently to accrue significant economic benefits.

The current funding model for flood risk management schemes does not significantly encourage Defra funded schemes to include critical infrastructure unless it is relatively inexpensive to do so. This is a deliberate decision to create the right incentives for operators to invest themselves in

infrastructure resilience, rather than rely on the taxpayer to pay.

Environmental outcomes

Environmental improvements can attract funding if related to statutory requirements (such as the European Water Framework Directive or the Habitats Regulations). Under the EU Habitats and Birds Directives, where habitat is lost or damaged as a result of flood and coastal erosion risk management, or coastal squeeze resulting from climate change, new habitat must be created to compensate for or replace it⁵⁶. The Environment Agency is reviewing OM4 to try to link FCERM measures with the Water Framework Directive.

Compulsory purchase and relocation

In certain circumstances it can be cheaper to purchase homes at flood risk or compensate landholders for reductions in property prices than pay for the necessary flood defences to protect the properties in the long term. Compulsory purchase of land and property is likely to have a poor business case as the HM Treasury's economic appraisal methodology⁵⁷ limits flood damages to the market value of the property. This means that unless there are additional benefits, for example, lowered risk to life, compulsory purchase may well have a benefit-cost ratio of less than one and hence not be eligible for grant funding.

Purchase of land is the key to making coastal and estuarial managed realignment schemes work. Here the cost of buying the land can be offset by benefits in the area outside of the actual land purchased. As part of a flood risk management options appraisal, supporting or facilitating relocation might be considered. Relocation and abandonment could be built into FCERM strategies in the long term. In order for the public to support the take up of these schemes, behavioural change, through

^{ix} CAP is a system of agricultural subsidies and programmes covering farming, environmental measures and rural development.

^x Countryside Stewardship is Defra's new agri-environmental scheme, which will help rural businesses improve the countryside environment. It

replaces Environmental Stewardship and the England Woodland Grant Scheme.

^{xi} The highly respected manual and handbook on the benefits of flood and coastal risk management produced by the Flood Hazard Research Centre at Middlesex University with support from Defra and the Environment Agency.

the currently successful pathfinder projects, could improve the public awareness.

Asset maintenance and other preventative work

Maintaining our existing defences and waterways is an essential part of building resilience to flooding. In England the Environment Agency maintains FCERM assets such as flood walls, embankments and pumping stations that it owns and many that it does not. The remaining assets are 'third party assets' that the Environment Agency neither owns nor maintains. They are routinely inspected but it relies on the individual asset owners to maintain them⁵⁸.

Third parties may include local authorities, Internal Drainage Boards, individual land and property owners and businesses. Of the total flood defences in England (more than 40,500 structures with a value of £35 billion), the Environment Agency is responsible for maintaining 45 per cent, with the remaining 55 per cent maintained by third parties⁵⁹. The Environment Agency is able to use its strategic overview role to encourage owners to maintain their assets well⁶⁰. If at any time there is a risk to the public from these assets, the Environment Agency can exercise its emergency powers and make sure repairs are completed.

Each year, the Environment Agency undertakes an exercise to allocate national funding for asset maintenance through the SAMP process, which identifies investment on

a case by case basis for all the assets it maintains. It considers the need for both capital and revenue expenditure over the lifetime of the asset system. Each SAMP identifies a minimum and an optimal maintenance regime for the asset system. The optimal is what would be needed annually for it to achieve its whole life benefits, balancing the need for ongoing attention (revenue expenditure) with longer-term repairs, refurbishment and renewal (capital expenditure)⁶¹.

All assets are funded to meet their minimum maintenance need. From the remaining budget, funds are allocated to assets using a sliding scale with a benefit: cost ratio of more than 8:1, although this is currently being reviewed. SAMPs also identify systems and assets which are uneconomic and are candidates for stopping maintenance.

The overall revenue budget for maintenance in 2014/15 is £170m (figure 2.4). From this budget the Environment Agency funds other preventative work; £60m a year is needed for preventative operations including inspections and the operation of defences and a further £45m per year for conveyance. Spend on conveyance works had fallen to £30m in 2013/14 until the additional emergency funds topped this up for 2014/15.

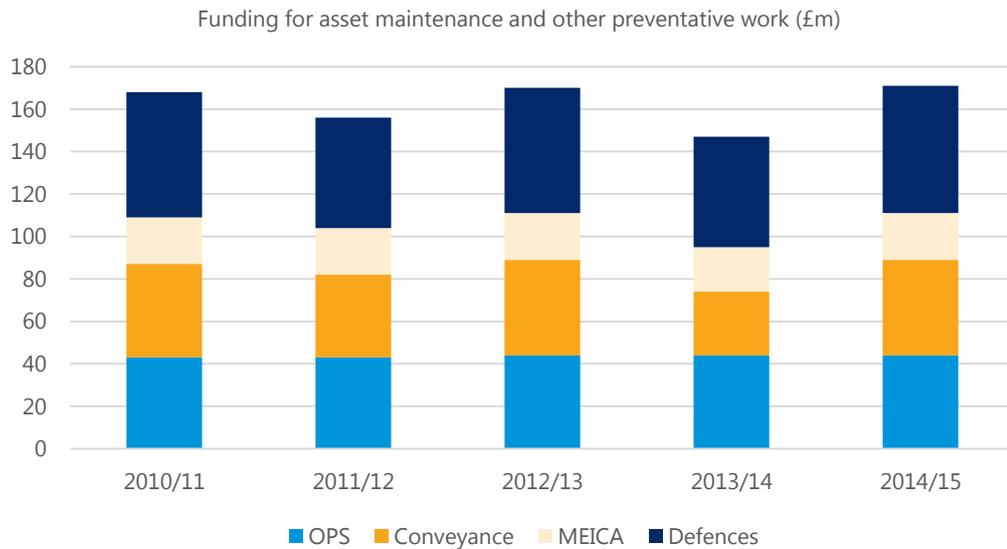


Figure 2.4 Funding for asset maintenance and other preventative work. NAO, 2014⁶², data from Environment Agency

OPS – can refer to inspecting assets, providing utilities, operating flood barriers and pumping stations to reduce flood risk and managing water levels.

Conveyance – allowing water to flow more freely along the river channel, e.g. controlling aquatic weeds, dredging, removing shoals and silt, clearing screens and removing obstructions from river beds.

MEICA – Mechanical, Electrical, Instrumentation, Control and Automation, such as carrying out minor repairs or maintenance of pumps and tidal barriers.

Defences – repairs and maintenance of existing structures and defences, e.g. managing grass and trees on flood embankments, controlling animal populations.

Changes to the Environment Agency’s role (from the national FCERM strategy to focus on flood risk management over land drainage) mean that it is no longer able to justify maintaining assets which chiefly drain land and provide little flood risk benefit. In 2013 it published a protocol⁶³ for the maintenance of FCERM assets. Investment decisions are made using HM Treasury guidance on economic appraisal to decide and prioritise where to do works and identify where it should stop. Funding will only be available where the work is of sufficient priority.

Chapter 4 features a discussion on whether enough money is being prioritised for asset maintenance and other preventative measures.

External contributions

Partnership funding

Following the devastating floods in 2007, the Pitt Review⁶⁴ recommended that the Government should set up a scheme to encourage local communities to invest in flood risk. In England this is being realised by the move to partnership funding which aims for as many communities as possible to enjoy the benefits that FCERM brings, and to create a level playing field between all sources of flood risk and coastal erosion⁶⁵. It gives priority to investment in actions that benefit communities which face the greatest risk and are least able to afford to help themselves. It also has a guiding principle that the general taxpayer should not pay to protect new development in areas at risk of flooding or coastal change, now or in the future.

The partnership funding approach has been implemented to prioritise funding for capital schemes in England since 2012/13, (figure 2.5 shows the difference between the old and new approaches). It aims to increase the amount of money available to enable more flood and coastal risk management schemes to go ahead through securing local contributions from those who benefit. It appears to be the equitable solution that is needed, however after only a few years, it may be too early to judge its effectiveness.

The Welsh Government did not adopt the Defra/Environment Agency position, because of a perception that poorer communities might be unfairly disadvantaged.

Under the partnership funding approach, cost savings can be delivered by redesigning the scheme or through value engineering to directly reduce the level of contribution required. For example, the Leeds Flood

Alleviation Scheme was due to cost £150m but through re-engineering has been reduced to a £50m scheme, reducing the need for contributions from around £120m to £20m.

The introduction of partnership funding coincided with considerable changes to delivery bodies' roles and changes in the policy context, such as the continued focus on localism. The *Localism Act 2011* provides local authorities with more financial freedom to encourage bespoke local funding arrangements⁶⁶. Defra have produced guidance⁶⁷ on all the funding streams available and have also undertaken a study to on the opportunities to increase the amount of funds for maintenance⁶⁸, (a number are outlined overleaf).

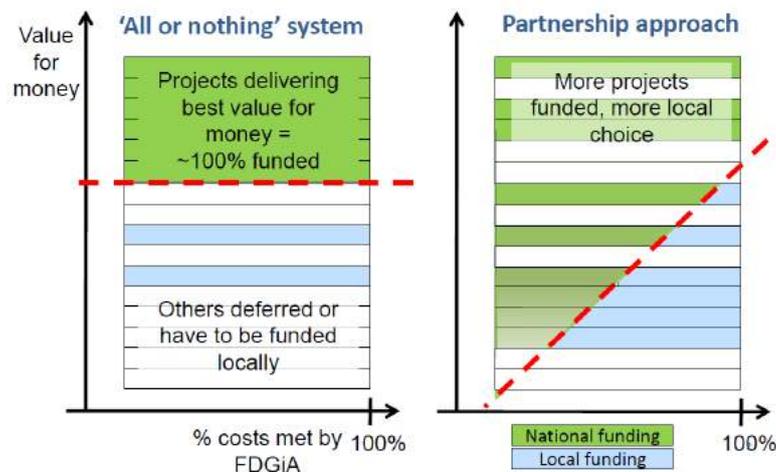


Figure 2.5. The Partnership approach. Defra⁶⁹

In the previous 'all or nothing' system only the projects with the highest benefit cost ratios were given funding and this covered the full cost of the project. Under the partnership funding approach other local contributions will be needed in order to make up any funding gap.

Other options

There are also options through Business Improvement Districts^{xiii} (e.g. Sheffield and Leeds schemes), Council tax referendums (e.g. Cumbria and Gloucestershire^{xiii}), business contributions (e.g. Pfizer in Sandwich⁷⁰, Anglian Water in Louth⁷¹), 'in-kind' contributions where local businesses provide plant and equipment, site security, or other requirements that reduce the costs of the project to the Environment Agency or where the local authority agrees to maintain a scheme.

Planning Obligations / Section 106 Agreements

A Planning Obligation is a mechanism for developments to pay for their non-market costs such as environmental damage. Planning Obligations, commonly known as s106 agreements, are an agreement between the local authority and developer on an individual and specific development, and are generally negotiated in the context of granting planning consent.

These agreements are also a way of delivering or addressing specific matters that are necessary to make a development acceptable in planning terms. For example, the agreement could relate to the construction and maintenance of a specific small flood risk management scheme which brings the standard of protection of the site up to a 1 in 100 standard and enables safe development to take place.

The Regional Growth Fund⁷²

This was set up in 2011 in order to boost the number of private sector jobs in areas which rely too heavily on public sector employment. There is a £3.2 billion fund operating across England from 2011-2017. Business cases can be submitted to BIS/DCLG through Local Enterprise Partnerships to apply for funding. Climate change is one of the themes which can be used to lever funding. The Growth Fund cannot be used to fund all flood risk schemes; only the ones which can be shown to protect business as the Leeds City Region Local Enterprise Partnership has done⁷³.

^{xiii} Business Improvement Districts (BIDs) are a partnership between businesses and the Local Authority to allow businesses to pay for additional services to improve trading conditions within the area.

Community Infrastructure Levy

The Community Infrastructure Levy (CIL) is a capital cost payable by developers towards the cost of local and sub-regional infrastructure to support development. The money can be used to fund a wide range of infrastructure that is needed as a result of development. This includes new or safer road schemes, schools, hospitals and other health and social care facilities, park improvements, green spaces, leisure centres and flood defences.

The CIL takes over from part of the section 106 process. Many Local Authorities have set up or are in the process of implementing their CILs. The charges are based on the size and the character of the development paying it. Rather than being a single agreement between a local authority and a developer, it applies charges on all new developments within certain localities. There is likely to be a high demand for other projects so only a limited amount may be available for flood schemes.

Tax Increment Financing

Tax Increment Financing is a debt-financing method by which today's infrastructure can be funded by tomorrow's beneficiaries. It should be used where infrastructure investment is needed imminently. It is used when building infrastructure or undertaking large necessary works will open up land for development which would not otherwise be possible to build on.

Once the infrastructure is built, new development is possible. The business rates and council taxes generated from the new development can be used to pay back the loan which financed the infrastructure. The local authority may have to set up an Agency or department to manage the bond payments, council tax and business rate receipts.

More organised forms of voluntary contributions are available. The Community Fund is a platform which elicits community crowd funding for flood risk and catchment management projects⁷⁴. It also advertises volunteering opportunities for people wishing to donate their time.

^{xiii} Gloucestershire County Council held a local referendum to allow Council Tax to be increased by 1.1 per cent to raise funds for investment in additional drainage and maintenance work after the 2007 floods. This provides around £2.3m per year towards FCERM activities in the county.

3. Future funding

Estimating risk

Ten years ago the Government's *Future Flooding Foresight* report⁷⁵ posed the question, what should our aims be for future flood management? Should society:

- ◆ Accept increasing levels of risk of flooding?
- ◆ Seek to maintain risks at current levels?
- ◆ Seek to reduce the risks of flooding?

The question is still pertinent today. In order to establish if enough is being invested in future flood risk management, the level of risk that is currently faced needs to be established.

There are currently around 2.4 million properties at risk of flooding from rivers and the sea in England^{xiv}. About three million properties are at risk from surface water flooding in England, and of these around 600,000 properties (20 per cent) are also at risk of flooding from rivers and the sea. The current risk from flood and coastal erosion would be far higher than it is today without the many decades of investment in FCERM in England and Wales.

Future annual damages are expected to rise as a result of the impacts of climate change and as existing flood defence assets deteriorate⁷⁶. And any additional inappropriate development that does not mitigate flood risk will also add to long term costs and risks. Without investment the Environment Agency estimates that over 50 years, the number of properties experiencing a one per cent annual likelihood of flooding from rivers and the sea would increase from 748,000 to 1.29 million, and that overall economic damages would increase by approximately 250 per cent⁷⁷.

^{xiv} At present there is not enough evidence to include risk from groundwater flooding in this analysis.

Climate change

The UK will be subject to climate change impacts from warming of the atmosphere and the ocean, changes in the global water cycle and in changes in some climate extremes⁷⁸.

Whilst there are uncertainties in climate predictions, the latest report from the Intergovernmental Panel on Climate Change finds that over the 21st Century under all assessed emission scenarios it is very likely that extreme precipitation events will become more intense and frequent in many regions⁷⁹. There also remains uncertainty in how factors such as the jet stream, important in influencing UK weather, might be affected by global warming⁸⁰.

Development

The population of England is predicted to increase by ten million by 2030⁸¹. It is essential that the impacts of this growing population, and the development of homes, infrastructure and services to support it, do not increase the likelihood of flooding.

In planning new development there should be a strong preference to avoid areas at risk of flooding and erosion. Where development in the floodplain is inevitable, as brownfield sites are developed, in addition to flood protection, flood resilient measures should be incorporated into the planning and designing of schemes.

Perception of risk

In 2013/14 a tidal surge followed by a series of winter storms caused around 7,700 homes, 3,200 commercial properties and some 49,000 hectares of agricultural land to be flooded. However the investment in flood and coastal erosion risk management assets, the 155 severe flood warnings and the operational response, led to 1.4 million homes and businesses and around 250,000 hectares of farmland being protected⁸². Yet the reaction by the public and the media shows

that they expect much more to be done to reduce the risks of flooding.

memory is poor when it comes to flooding and this goes some way to explain the reactive nature of funding.

Figure 3.1 puts the 2013/14 losses in perspective with other events over the past 15 years. It shows that the losses in 2013/14 are not uncommon and represent what might be expected every four to five years⁸³. Collective

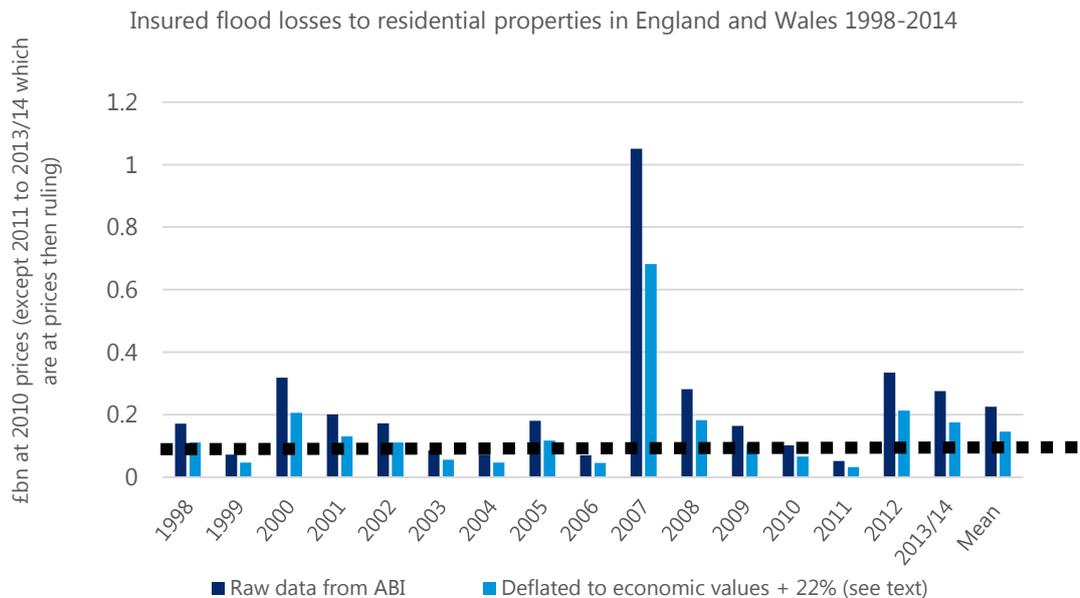


Figure 3.1. Insured flood losses to residential properties in England and Wales 1998-2014. Penning Rowsell⁸⁴

NOTE: These data only shows residential losses. The Association of British Insurers (ABI) does not represent the whole market (c. 82per cent). All the figures here have been converted to national economic values, by deducting VAT, and converting the financial losses (those suffered by the householder), to economic losses to eliminate the "betterment" element in flood loss compensation as included in the insurance claims. (See Penning-Rowse 2014, endnote 2, for details).

Despite a drive to improve awareness of risk of flooding by the Environment Agency and the National Flood Forum, awareness of those that live within the floodplain remains low. In 2012/13 only eight per cent of those living in a floodplain were aware that they were definitely at risk and a staggering 55 per cent thought they were not at risk at all⁸⁵.

Foresight notes that it is unknown how the change in perception of risk will change over time. It describes a *social amplification of risk* where society picks up signals of risk from those directly affected by an incident and assumes those risks are uniform in society⁸⁶.

This could explain the amplified reaction to the 2013/14 floods, but does not explain why those in a flood risk areas are not aware.

In making policy and funding decisions, the level of 'acceptable' risk needs to be considered. This is unlikely to be uniform and will vary depending on the type of property/land protected. For instance, Environment Agency fluvial schemes are often designed to withstand a 1 in 100 year event, surface water to a 1 in 30 year event and more critical infrastructure such as hospitals to 1 in 1000 year event standard.

Optimal investment

In order to plan budgets an estimate of the future risk of flooding is needed. Expected Annual Damage (EAD) is used as a metric as it takes into account both probability and consequence, and all economic impacts rather than just damage to households.

National Flood Risk Assessment (NaFRA)

Average annual damages of around £1bn from flooding are often quoted from the National Flood Risk Assessment for England and Wales. If the £1bn figure is used then this would mean that expected annual damages would be similar to those from the exceptionally damaging July 2007 floods each year. As Figure 3.1 shows the current reality is a long way from such an impact.

The figure first suggested in 2002 has not been re-evaluated with new evidence and has propagated through various assessments over the past decade (i.e. Foresight, 2004; EA LTIS 2009⁸⁷; NAO 2011⁸⁸ and the Adaptation Sub Committee, 2012⁸⁹). Floods have other impacts but it is the economic impact that mainly drives policy and expenditure on FCERM measures. It is important that this figure is as accurate as possible as it guides Defra's allocation of resources for FCERM, guides the Environment Agency's long term investment scenarios, affects planning and development policy and is used by the insurance industry. A new paper⁹⁰ suggests that the level of national annual economic fluvial and coastal flood risk^{xv} in England and Wales is between £0.192bn and £0.268bn with a central estimate of £0.25bn. This indicates that the £1bn figure that has become embedded within present thinking is four to five times higher than the current situation.

The Environment Agency published long term investment scenarios⁹¹ in 2014 which identify the optimum return on investment over the next 100 years for each asset system taking into account asset deterioration. The 2014 scenarios update the 2009 assessment to include the latest national assessments of present day risks of flooding from rivers, the sea and surface water, and from coastal erosion, and information on asset type, status and condition. The model uses the location and condition of the existing 3000 asset systems^{xvi} and systematically works through five investment options^{xvii} to find the combination with the maximum economic return. It also tests scenarios for climate change and development control.

The model seeks to identify the optimum investment assuming no investment constraints. This is the point at which net benefit is at a maximum (Figure 3.2 overleaf). Below this point it is economically advantageous to invest more, but beyond this point the additional cost is not matched by additional benefits. From the model, the Government's intention is to reduce risk by around five percent by 2021 and reduce expected annual damages by 12 per cent to 2050⁹². Benefits are valued according to the economic damages avoided by making the investment, including the benefits of protecting homes and businesses, farmland and infrastructure.

The model provides a neat answer to the Foresight question - reducing risk by five per cent provides the optimum return on investment. Investing further to reduce risk would see diminishing returns and it would become increasingly more expensive to lower the risk further.

^{xv} This analysis does not cover flooding from groundwater or from reservoirs.

^{xvi} The 3000 asset systems are those from the SAMP process. There may be more than one asset in a system and around 50 systems in a catchment. In

reality investments will be appraised at the sub system level.

^{xvii} Do nothing, maintain crest level, maintain risk, improve to 1 in 100, and improve to 1 in 200.

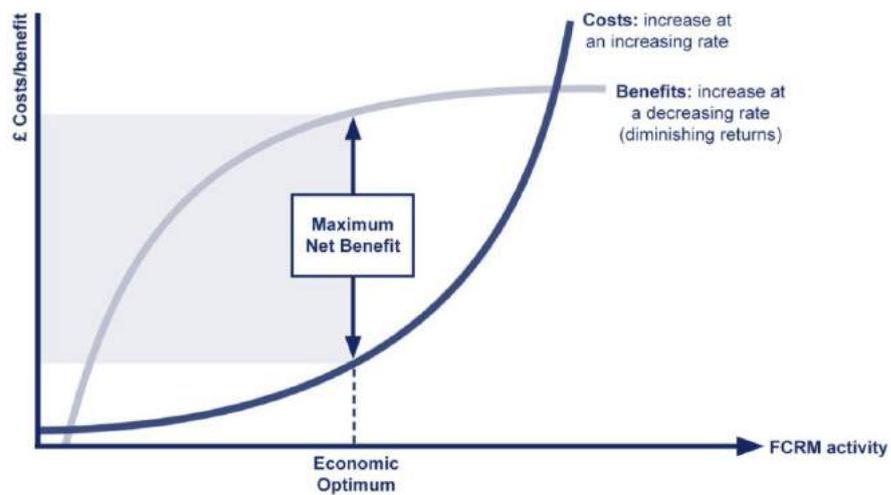


Figure 3.2 Economic annual average optimum to maximise net benefits. Environment Agency⁹³

The new LTIS suggests that the optimal investment profile in the first ten years will be around £750m to £800m a year in present day costs). It expects this to rise from the 2020s to the 2040s to £850m to £900m a year⁹⁴ (figure 3.3). Once discounted to present values, the cost of funding all activity to

manage flood and coastal erosion risk where benefits are greater than costs would be around £25 billion over the next 100 years. This takes into account the expected rate of deterioration of flood defences and future maintenance but future damage from major storms may need additional repair funds.

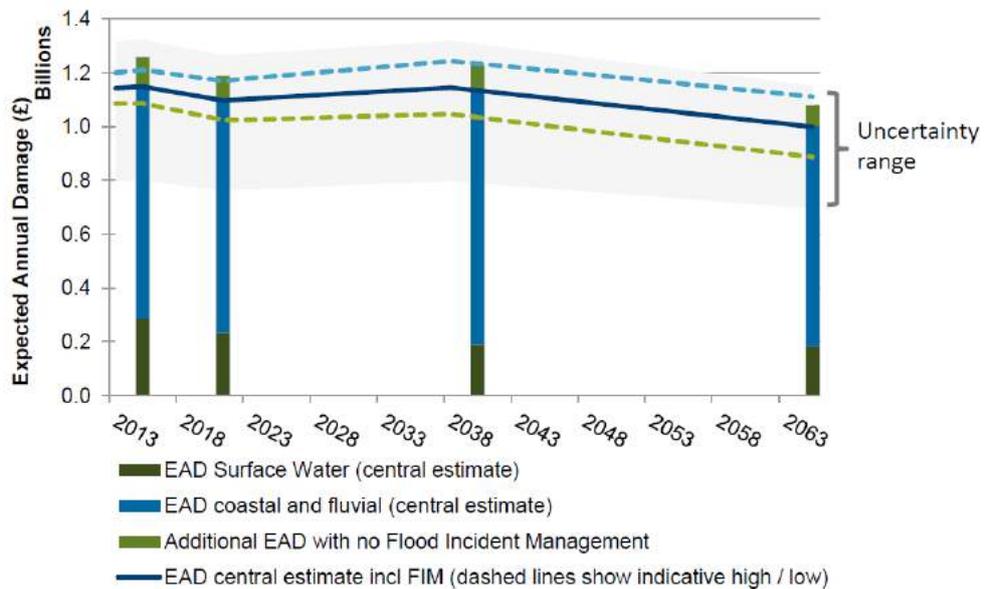


Figure 3.3 Projected change in national risk associated with assessed annual average optimum investment level. Environment Agency⁹⁵.

Whilst the potentially over exaggerated NaFRA figure has been used in the LTIS, the model has been tested with a lower baseline scenario of risk and the level of future investment identified by the model is similar.

Future investment plans

Figure 3.4 shows current and planned future spending on flood and coastal defence up to 2020/21 and compares it against the latest assessment of need published in the LTIS. Defra has announced current spending plans of around £750m, including all public and third party sources) with an average benefit cost ratio at a national level of 5:1⁹⁶.

Defra states that current plans are broadly in line with the long-term optimal spending trajectory to 2020/21, if government investment is supplemented by partnership funding contributions of 15 per cent (around £58m a year) and targeted efficiency savings (ten per cent) are made. This level of planned investment is cost-effective regardless of future levels of climate change but it is assumed that new development does not add to flood risk.

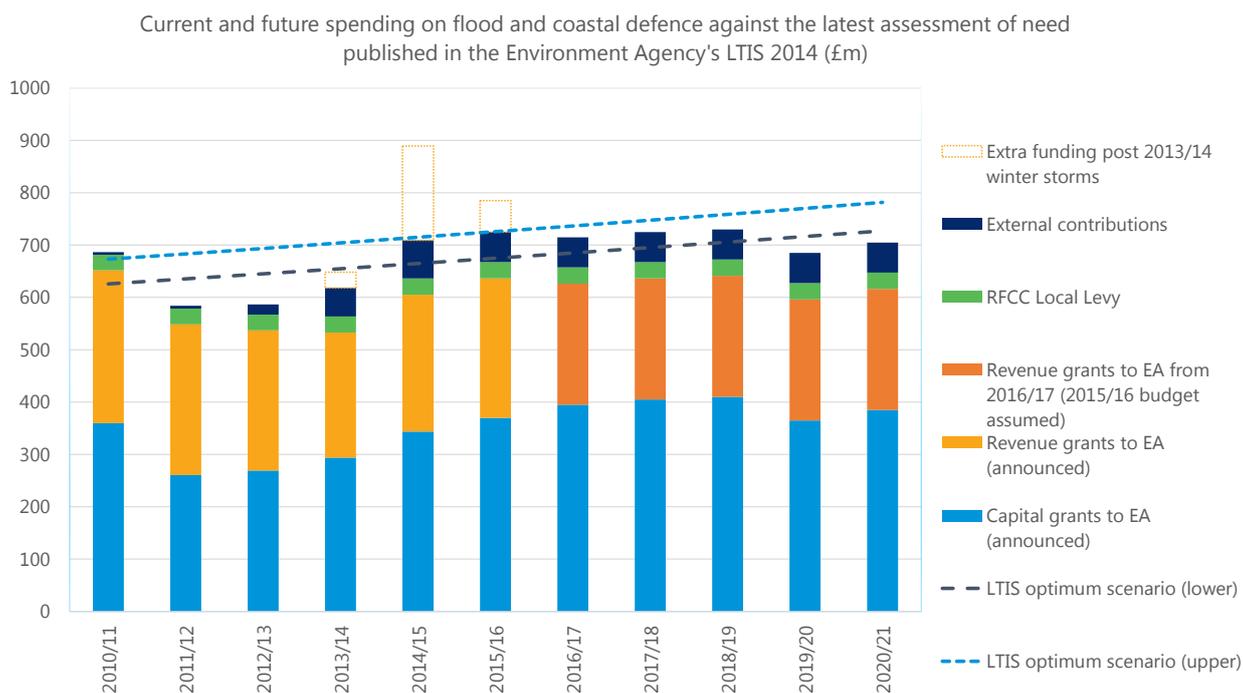


Figure 3.4 Current and future spending on flood and coastal defence against the latest assessment of need published in the Environment Agency's long term investment scenarios 2014

Data from Defra⁹⁷ and Environment Agency⁹⁸ via Committee on Climate Change⁹⁹. Figures are presented in real terms, in 2010 prices. Graph adapted from Daniel Johns at the Committee on Climate Change and Nicole Shamier.

Figures are presented in cash/nominal terms.

The optimal investment scenario is between £750m and £850m a year so is shown as an upper and lower range.

The Environment Agency's efficiency savings intend to offset inflation from both the revenue and capital budgets over the four years to 2015. To reflect this, inflation has been removed from the LTIS scenarios over the same period. The EA has committed to achieve a further 10 per cent in efficiency savings within the capital programme between 2015 and 2021. This is taken into account in the optimal scenario of the LTIS.

Revenue/resource funds have not yet been announced so these figures are assumed to remain at the 2015/16 level.

External contributions totalling £140m are shown for the period 2011/12 to 2014/15. From 2015 the Environment Agency has committed to add 15 per cent to the capital programme from external funding sources, with a total of £345m expected as at December 2014. This is shown as an average £58m a year.

The extra funds post 2013/14 winter storms are assumed to have been spent reinstating defences to their pre-storm state and are not factored into long term investment plans.

As [figure 3.4](#) shows, to meet the optimum trajectory, resource funds (not yet announced) may need to increase beyond present levels. The likelihood of this and other assumptions being met are discussed in Chapter 4.

In the longer term, capital funding has only been announced to 2020/21. There is uncertainty in the timing of future investment, with peaks and troughs as assets deteriorate ([figure 3.3](#)). The optimum investment would be front loaded to achieve the benefits for a longer period of time increasing the cost benefit ratio, but this assumes no investment constraints. Future governments will have to reassess national risk but this work is pivotal from a forward planning perspective.

The baseline scenario for the model includes a level of 'medium' climate change as defined by the most up to date national projections (UKCP09). Using the 'high' climate change projection instead adds £60m (seven per cent) to the average annual cost and limits the reduction in national risk to four per cent compared with today. Removing climate change altogether would decrease costs by 13 per cent.

Flood Insurance

For those at high risk of flooding the Government is taking steps to ensure that flood insurance remains affordable. In the UK, Part 4 of the *Water Act 2014* directs the creation of a 'Flood Reinsurance scheme' known as 'Flood Re' which will be launched in 2015. The scheme has been designed to pay out for up to a 1 in 200 flood event (a relatively large flood with a 0.5 per cent chance of happening in any one year).

In order to ensure that the premiums are affordable, the insurance charge for most

residential properties in high risk areas will be capped based upon council tax bands. Current estimates of the cap are £210 per annum in Bands A and B, rising to £540 per annum in Band G. The costs associated with capping premiums will be spread amongst all residential properties in the country at around £10.50 per property. This means that there is a £180m annual cross subsidy from homeowners not at flood risk to the 500,000 at highest flood risk.

There are exceptions. Business properties will not see their insurance costs capped. Leaseholders in blocks of more than three flats will have their contents, but not their buildings' insurance capped.

Properties built after 1 January 2009 will not benefit to avoid incentivising house building in flood risk areas. Developers may need to rethink plans to build non flood-resilient properties within a floodplain. Purchasers of new homes in flood risk areas should make sure insurance is available at a reasonable cost before signing contracts. This should be done by the conveyancer and environmental data and property search providers must now satisfy the minimum requirements of the Law Society *Practice Note: Flood Risk*¹⁰⁰.

As subsidised insurance keeps house prices in the floodplain artificially high, the scheme is set to move to actuarial pricing over the next 20 to 25 years. The amount of the primary levy and the reinsurance premium thresholds will be reviewed every five years, or sooner if required, by the Flood Re Administrator. The intention is to give those that are at risk the next 25 years to more become more resilient to flooding so that affordable insurance remains available on the basis of the physical risk being addressed, as opposed to subsidies being available. However it is not yet clear how the transition to risk-reflective pricing will be made.

4. Discussion: Are we prepared for the future?

Reducing risk

As this report highlights, funding for flood and coastal erosion risk management is a highly complex process involving a number of different government departments and organisations and a range of funding streams. Within the veil of numbers almost all decisions come down to economic criteria to achieve the best return on investment and incentivise action by those who are most able to take it.

Politicians and the media are able to use the variation in numbers to tell a story one way or another. Under scrutiny, the background trend shows falling central Government expenditure over the past few years, until the 2013/14 flood events and the emergency funding for repairs and recovery afterwards. This has skewed the data bringing funding up to a similar level as the previous five year spending period. While the additional funds may push total spending levels higher than in 2010, the extra was used for emergency repair works and not planned preventative FCERM activities to reduce risk.

Funding has tended to follow prevailing socio-economic factors. Long term planning for flood investment is essential and the recent work by the Environment Agency is particularly welcome. Greater certainty in future investment needs will allow better understanding of resource requirements, more efficient use of resources and the development of long-term and flexible solutions.

The Environment Agency's long term investment scenarios show, by modelling optimum economic investment, how difficult it is to reduce risk past a certain point, as investing further to reduce risk would yield diminishing returns. The LTIS has its limitations as it uses strict economic criteria in investment decisions and it cannot consider local preferences and other considerations that might come into play (e.g. partnership funding). However it is a useful guide.

Investment programme to 2021

Despite criticisms on funding levels, internationally the UK is regarded as forward thinking in that it is one of the few governments that invests proactively to reduce flood risk rather than just spending on post event recovery costs. And the Government is aiming to reduce rather than maintain the current level of risk. This is despite the permissive powers on flood risk authorities.

The current Government's investment programme aims to reduce overall risk by around five per cent by 2021, in comparison to present day risk. Assuming this is continued by the next Government, delivering the programme will depend on the final agreement of resource funds (they are assumed to be maintained at present levels), if efficiencies of ten per cent are achieved on the capital programme and if partnership funds materialise. It is important that going forwards revised long-term scenarios are used to monitor and review progress as well as set future direction¹⁰¹. The likelihood of investment plans being realised to 2021 is now discussed.

Partnership funding

The partnership approach acts to increase returns on investment by topping up funding from those who benefit directly. It is set to deliver £140m in the current spending period and add 15 per cent to the capital programme each year between 2015/16 and 2020/21 (around £58m a year) which is the target agreed by HM Treasury. Working in partnership should also allow for efficiencies in delivery to be made.

CIWEM supports the emphasis on partnership funding as it aims to increase the number of schemes being supported, increases local choice and should lead to an increase in external contributions. It introduces the concept that beneficiaries should contribute towards schemes from which they derive gain, which would not otherwise go ahead.

Partnership funding review¹⁰²

In 2014 Defra commissioned a review into how partnership funding was being implemented and whether the policy's objectives are likely to be delivered. The review suggests that overall investment is increasing:

- ◆ 36 per cent in 2012/13, 71 per cent in 2013/14 of new projects have some level of partnership funding
- ◆ £120m anticipated contributions for new projects in first two years of the policy
- ◆ Up to £140m from all projects with partnership funding by 2015
- ◆ 75 per cent via public bodies – including Community Infrastructure Levy and section 106¹⁰³

The requirements of the *Flood and Water Management Act* for LLFAs to manage surface water and its inclusion in the partnership funding approach since 2012 has made encouraging progress to increase the number of surface water/ground water flood schemes. Prior to 2012/13, there was no category for surface water/ground water schemes and 14 per cent of all schemes were addressing this flood risk source, in 2013/14 this had increased to 34 per cent of schemes.

The review found that at present there is no clear evidence of a shift in resources towards deprived communities than was previously the case. It recommended that the impacts of partnership funding on deprived areas should be monitored closely with the implementation of targeted actions if policy aims are not being met. Only a minority of schemes with reserved funding target properties at a high risk of flooding and in a highly deprived area. This proportion has stayed at a similar level for the last four years (less than ten per cent).

The National Audit Office's 2014 assessment makes clear that it is too early to judge the effectiveness of partnership funding. However it notes that current partnership funding from third parties is primarily large one-off contributions for a small number of projects, making it a potentially volatile source of income year on year¹⁰⁴. The review of partnership funding states that "*local authorities are a key source of contributions; with continued public sector funding cuts, this may not be sustainable*"¹⁰⁵.

The Environment Food and Rural Affairs Committee has expressed concern that it will be a challenge to achieve the £600m that is needed to pursue to the 1400 flood schemes announced in Defra's long term investment

plan. Of the 1400 schemes announced to take place in the Autumn Statement 2014, 213 are already underway and 39 expected to start by March 2016. Two hundred of the schemes will not start construction until 2021 or later as many do not have a sufficiently well-developed case to enter the development programme at this stage. It is worth noting that the sum of £600m is not what is included in the £2.3bn investment plan, which instead includes an expectation for partnership funding to attract £345m to 2021. Although the headline number of schemes may be misleading, it shows the scale of Defra's ambition and indicates the importance that external funding will be to scheme delivery in the future.

The amount of funding from private sources to date has been criticised. However it is difficult to judge as some funds have come from private sources but have been re-routed, for example via the Community Infrastructure Levy to Local Authorities. It is particularly welcome that as of January 2015 the Government has made available income and corporation tax relief for businesses that contribute towards partnership funding schemes¹⁰⁶.

Depending on the success of partnership funding, other measures to encourage the private sector to contribute may need to be sought in the future. In any event a new approach like partnership funding will take many years to become mainstreamed and the early years of performance should not be taken as a barometer for the long term future.

Efficiencies

The six year capital settlement will allow much greater efficiencies to be achieved in the delivery of schemes. Since 2010 the Environment Agency has already successfully increased efficiency in capital projects by 15 per cent. It has now committed to achieve an ambitious further ten per cent efficiency saving overall for the capital programme between 2015 and 2021 and hold costs at that level beyond.

Certainty in funding will unlock efficiencies. However there is uncertainty as to whether this will add up to the £230m that is needed to deliver the long term investment plan, as

the costs of construction could rise as well as fall and there could be potential supply chain constraints in the future.

The LTIS does not assume any efficiency gains by 2021 in non-capital costs (i.e. revenue spend (staff)). There is a concern that there could be further pressures on these budgets at the next spending review which will affect not only the Environment Agency but other risk management authorities. These organisations are already facing budget cuts which will affect their capacity and resources and ability to plan for the future.

The number of staff engaged in flood risk management within the Environment Agency fell by 800 (20 per cent) after the 2010 spending review, with a decrease of over 400 in the asset management teams responsible for the maintenance of defences and the response to flood incidents¹⁰⁷. Staff numbers in non-asset related tasks such as development control and flood incident management have significantly declined. A further 1150 jobs have been lost from the Environment Agency to October 2014 though not specifically in FCERM¹⁰⁸.

Once these skilled engineers and other specialists are dispersed to other sectors it is unlikely that they would return to FCERM and the resource base will take a number of years to be rebuilt.

Allocation of funds – balance of capital and maintenance

For the estimated reduction of risk of five per cent by 2021, the LTIS assumes that the performance of current assets and incident management service are maintained at current levels. However this budget has not been agreed beyond 2015/16.

It also assumes the most efficient allocation of resources between capital and resource activities. Yet a less than optimal balance could increase whole life costs, particularly affecting the timing of asset replacement. The choice is highly political as in recent times the Government has been trying to shed responsibilities to reduce future financial liabilities.

Due to pressures on budgets, regular maintenance spend declined in the current spending period and as a result the percentage of assets achieving their target condition dropped from the Environment Agency's target of 97 per cent to 94 per cent¹⁰⁹. Following the winter floods funding was re-instated and asset condition has improved.

In 2014/15 the overall budget for maintenance is £170m which includes asset maintenance and other preventative measures (figure 2.4). Spending on conveyance had been cut prior to the 2013/14 events. It is most liable to reduce when funding is under pressure because it tends to have lower benefit: cost ratios than other activities¹¹⁰. There is also an understandable higher priority for assets that have mechanical and electrical maintenance that is needed to keep them in safe working order.

Analysis of Environment Agency data by the Committee on Climate Change suggests that the current resources (even after reinstatement) will mean that almost three quarters of flood defence asset systems will not be maintained in 2014/15 according to their optimum annual need¹¹¹. Instead they will receive the minimum required, and may receive the optimum every two, three or four years. This effectively reduces the life of an asset so capital replacement may be needed earlier than is otherwise necessary.

If the LTIS assumes that asset performance is maintained then resource budgets may need to be higher than the Government anticipates, as £170m a year is not delivering the optimum at present and is unlikely to be enough in the long term. Generally ad-hoc emergency spending is worse value than sustained maintenance¹¹² and inadequate levels of funding for maintenance may be storing up a potential cost for the future.

There is the opportunity through capital schemes to secure on-going operation and maintenance funding or delivery through partnership funding. This has been done successfully in a few cases but there is a lot more scope to take the advantage of the existing partnership funding model¹¹³. Communicating the benefits of maintenance activities to potential investors is a challenge

so good practice and successes should be showcased.

Local flood risk management strategies

Local flood risk management strategies support the Environment Agency and Natural Resources Wales' overarching flood risk management strategies for main rivers, the sea and reservoirs. Despite being funded to do so from 2011, as of March 2014, only 16 per cent of Lead Local Flood Authorities had finalised a local strategy¹¹⁴. Although there will have been progress since these numbers were published, it has been far too slow and they need to be completed as a priority.

The completion of local flood risk management strategies will allow local authorities and other partners to consider their long term options and what further adaptation and resilience strategies are required for their communities. Wider aims such as how to increase resilience to flooding through an increased understanding and awareness of risk, how land use planning will be integrated, from hard defences to working with natural processes, and how businesses and infrastructure will be made more resilient will be extremely useful to guide both national and local investment plans for flood and coastal erosion risk management.

The Committee on Climate Change notes that the latest local authority outturn figures suggest the amount they are spending on flood risk management has not increased by the amount Defra has provided: *"More than half of the £129 million being provided is not being spent on local flood risk management"*¹¹⁵. As a result of public funding cuts resources in local authorities have been stretched and as the additional funding made available are not ring fenced, flooding has had to compete with other local authority services.

Without a fully formed local flood risk management strategy, most local authorities will not have a clear idea of the scale of investment required to implement their action plan. This is likely to impact on their ability to progress schemes in the early years of implementation¹¹⁶. To secure sufficient Local Services Support Grant to deliver even their statutory obligations Lead Local Flood Authorities may need to make a strong

business case locally¹¹⁷. Local flood risk management strategies are essential to provide the evidence base for this.

Managing residual flood risk

The reduction in flood risk will not be uniform. Using the modelled optimum investment scenario the LTIS indicates a net movement of around 300,000 properties from a 1:100-1:200 level of risk to below 1:200 by 2065. However the number of properties at high risk (>1:30) increases by around 80,000. The number at medium risk (1:30 - 1:100) stays around the same. This is because it is better value for money to tackle the lower risk homes. To tackle the high risk homes would be increasingly more expensive, as for example, they may be in sparsely populated areas, where the relative costs of protection are higher¹¹⁸. This raises questions over what to do with properties in high risk areas in the long term.

Attitudes to flood risk are alarming with more than half of people living on the floodplain thinking they are not at all at risk and fewer than ten per cent knowing and accepting they live in a flood risk area¹¹⁹. Clearer communications on flood risk are needed so people are aware of the risk when purchasing a property, what their insurance premiums may be in the future and what steps they can take as a householder to improve their resistance and resilience to floods.

In areas where maintenance has been deprioritised, typically where there are a low number of homes (for example the maintenance works on the Somerset levels) there is a far greater role for communicating the risks to these communities and seeking external contributions for works. Communication will be especially important in the case of schemes that will change the location of defences (managed realignment) or relocation.

Whilst not explicitly considered in this report there are also other FCERM measures, for example resilient design, land management policies and natural flood risk management which could reduce the risks further and

provide better value for money. Changing the way land is used upstream can be used to reduce flood flows and working with natural processes can reduce the need for hard defences.

Further progress on valuing alternative approaches to FCERM projects such as natural flood risk management and sustainable drainage systems is needed. Ongoing work by the Environment Agency on *working with natural processes* is welcome and will assist with integrating these measures into planning and appraisal processes in the future.

It is not possible to include these measures within the LTIS analysis as they are not mapped at the national level and their maintenance is not included in the cost baseline. The Environment Agency estimates that £30m a year could be invested cost effectively in sustainable drainage systems which would more than offset the impacts of climate change and urban creep.

Development

The population of England is predicted to increase by ten million by 2030¹²⁰. Making sure that this development is planned for sensibly, not in areas of flood risk nor contributing to it, is essential. Yet building is continuing in areas of flood risk. Despite planning policies^{xviii} being in place, 4000 new properties per year were built in areas of *significant* flood risk over the decade to 2011.

The Environment Agency is a statutory consultee for planning in areas at risk of flooding from rivers and the sea (Flood Zones 2 and 3) and large developments in Flood Zone 1¹²¹. Where the Environment Agency is consulted, its advice is largely followed (99 per cent of new homes had planning outcomes in line with Environment Agency advice between April 2013 and March 2014¹²²).

^{xviii} DCLG Planning Policy Statement 25 Development and Flood Risk (PPS25) and the subsequent National Planning Policy Framework (NPPF).

^{xix} This may have been due to a weakening of PPS25 when it was incorporated into the NPPF.

However it is not consulted with regards to minor development (under ten dwellings)^{xix}. As a result an estimated 12,000 minor applications in the floodplain did not receive site-specific advice in 2013¹²³. Developers and local authorities have to rely on generic advice in these cases. Following recent consultation Lead Local Flood Authorities are expected to have a future role as a statutory consultee on planning applications in relation to surface water drainage, however again this will only be for major developments^{xx}.

The Committee on Climate Change is currently collating data on new house building in the floodplain over the last three years. An assessment of the cumulative impact of this on flood risk should be incorporated into flood risk management plans.

The baseline scenario used in the LTIS assumes effective development control in future. The other scenario that is tested is one where development in the floodplain follows projected rates of population growth as suggested by the Office for National Statistics. The uncontrolled development scenario adds 16 per cent to the cost of optimal flood protection compared with the 'baseline' scenario¹²⁴. Every year in the decade to 2011, around 22,000 new properties were built in the floodplain¹²⁵. Costs for FCERM could considerably rise without effective development control in the future.

Some development in the floodplain is inevitable and is acceptable as long as it is properly planned and designed with mitigation and resilience measures in place.

Flood Re

Flood Re keeps house prices in the floodplain artificially high and therefore does not send out the right price signals to those purchasing properties. Flood Re is a temporary solution

^{xx} As defined by Article 2 of The Town and Country Planning (Development Management Procedure) (England) Order 2010.

and it needs to be communicated to high risk households that over time their insurance premium will rise as Flood Re is withdrawn, and cover in the long-term may be unavailable unless steps are taken to protect their property.

The Committee on Climate Change has been highly critical, claiming the scheme costs three times more than the benefits it provides as the scheme does not target those who cannot genuinely afford flood insurance and insurance companies are not retaining enough of the risk¹²⁶. The money would be more cost effectively used if it were to prevent flooding rather than funding clean-up costs post event. It estimates that at the current rate of rollout of property level protection (1800 homes by 2021), it will take 600 years to meet the cost effective potential for such measures to be fitted.

As it is currently formulated the scheme strongly dilutes market drivers to those concerned to make the required property level investment. It has not yet been made clear how the transition to risk-reflective pricing will be made and communicated. A number of options could be introduced, for example using Flood Re to provide surveys for those at high risk, introducing a penalty system should a household make multiple claims without taking action to increase their resilience, or following a similar 'pay as you save' model to the Green Deal whereby householders could have their home retrofitted and pay it back over time. CIWEM hopes the options will be clarified before the scheme begins this year.

Recommendations

- ◆ Future governments should fund flood and coastal erosion risk management at a level which meets the ambition agreed in the Environment Agency's long term investment scenarios and reflects the latest understanding of risk.
- ◆ Defra should work with Infrastructure UK within HM Treasury to commit to funding a maintenance and support programme for flood and coastal erosion risk management to match the current six-year plan for capital works. Continuity and confidence in funding is essential to stimulate the supply chain to achieve the efficiencies necessary to deliver Defra's investment plan.
- ◆ Local flood risk management strategies should be completed by all Lead Local Flood Authorities as a matter of priority to provide the business case to influence funding allocation and implement their action plan. Strategies will also assist in identifying cost effective early actions to reduce flood risk and resolve how to communicate with the public, raise awareness and encourage local leadership.
- ◆ Effective development control will considerably lower the costs of future flood and coastal erosion risk management. Local planning authorities must be robust in their approach to this.
- ◆ Policies or funding streams should not incentivise building in the floodplain unless effective mitigation and resilience measures are included and the development in question is appropriate for its location.
- ◆ The progress of partnership funding should be monitored and reported on annually by Defra to show how effectively it is growing and whether there is a need for any further intervention.
- ◆ Defra should ensure that Flood Re, the transitional flood reinsurance scheme, has an explicit aim to build awareness of risk with those receiving assistance. It must incentivise owners to implement property level protection to increase their flood resilience so that they are insurable once the scheme ends.

Glossary

| | |
|---|--|
| Flood and Coastal Erosion Risk Management (FCERM) | Managing flooding and coastal erosion involves knowing when and where floods and coastal erosion are likely to happen and taking reasonable steps to reduce the likelihood of them happening. It includes adapting to coastal change and acting to reduce the risk to life, damage and disruption caused by flooding. It also includes forecasting and providing warnings of floods so that people can take effective action to minimise the consequences of floods. |
| FCERM Grant in Aid | Grant-in-aid is money from central Government for a specific project. In the case of flooding it is provided from Defra to the Environment Agency. This kind of funding is usually used when the Government and parliament have decided that the recipient should be publicly funded but operate with reasonable independence from the state. |
| Flood risk | The Environment Agency describe the chance of flooding in one of four categories: High - greater than or equal to 1 in 30 (3.3%) chance in any given year; Medium - less than 1 in 30 (3.3%) but greater than or equal to 1 in 100 (1%) chance in any given year; Low - less than 1 in 100 (1%) but greater than or equal to 1 in 1,000 (0.1%) chance in any given year; Very Low - less than 1 in 1,000 (0.1%) chance in any given year. |
| Floodplain | A floodplain is the area that would naturally be affected by flooding if a river rises above its banks, or high tides and stormy seas cause flooding in coastal areas. For planning purposes floodplains are zoned, zones 2 and 3 show the extent of the natural floodplain if there were no flood defences or certain other manmade structures and channel improvements. |
| Flood Zone 3 | In England this is the area with a chance of flooding from the sea with a 0.5 per cent (1 in 200) or greater chance of happening each year; or from a river by a flood that has a 1 per cent (1 in 100) or greater chance of happening each year. |
| Flood Zone 2 | In England, areas that are likely to be affected by a major flood, with up to a 0.1 per cent (1 in 1000) chance of occurring each year. |
| Flood Zone 1 | Where flooding from rivers and the sea is very unlikely. There is less than a 0.1 per cent (1 in 1000) chance of flooding occurring each year. The majority of England and Wales falls within this area. |
| Flood risk asset | FCERM assets include maintained river channels, raised embankments, floodwalls and seawalls, culverts and sustainable drainage systems (SuDS). Flood defences do not completely remove the chance of flooding and can be overtopped or fail in extreme weather conditions. |
| Asset system | Normally a number of assets will be used together to manage the risk in a particular area. A collection of assets that protect a discrete area known as a system. |
| Residual flood risk | Accepting that a flood may cause some disruption that is prepared for or is dealt with when it occurs. |
| Expected Annual Damage | Expected annual damage takes account of probability and consequences and of all economic impacts rather than just damage to households. It captures all reductions in flood risk from investment, and the benefits of flood forecasting, warning and emergency response are also recognised by a reduction in the consequences of flooding. |
| Flood and Water Management Act (FWMA) | The Flood and Water Management Act was introduced in April 2010 in England and Wales. It was intended to implement Sir Michael Pitt's recommendations following the widespread flooding of 2007 which was largely caused by surface water runoff overloading drainage systems. |
| Regional Flood and Coastal Committees (RFCCs) | Regional Flood and Coastal Committees have a key role in the co-ordination of FCERM by advising on and approving the implementation of programmes of work for their areas, and supporting the development of funding for local priority projects and works. RFCCs also provide for local democratic input through the majority membership of representatives from Lead Local Flood Authorities. |

| | |
|--------------------------------------|---|
| Lead Local Flood Authorities (LLFAs) | Lead Local Flood Authorities are county councils and unitary authorities. They are responsible for risk management actions for flooding from surface water, groundwater and ordinary watercourses in their area. |
| Internal Drainage Board (IDBs) | Internal Drainage Boards are an integral part of water level management in the UK. They are independent public bodies responsible for managing water levels in low-lying areas. Each IDB operates within a defined area, known as a drainage district. They are made up of elected members who represent land occupiers, and others nominated by local authorities who represent the public and other interest groups. There are 113 in England and three in Wales (two of which cross the border). |
| Riparian owner | Anyone who owns land or property next to a river, stream or ditch is a riparian landowner and has responsibilities for flood risk management. |
| Main river | Main rivers are a statutory type of watercourse usually larger streams and rivers, but also some smaller watercourses. Defra decides which are main rivers and the Welsh Government does this in Wales. |
| Ordinary watercourse | Ordinary watercourses include every river, stream, ditch, drain, cut, dike/dyke, sluice, sewer (other than a public sewer) and passage through which water flows and which does not form part of a main river. |
| Awarded watercourse | Where the responsibility of a water course is transferred to a different authority with Government consent |
| Groundwater flooding | Groundwater flooding occurs when the water table in permeable rocks rises to enter basements/cellars or comes up above the ground surface. Groundwater flooding is not necessarily linked directly to a specific rainfall event and is generally of longer duration than other causes of flooding (possibly lasting for weeks or even months). |
| Surface water flooding | In prolonged, exceptionally heavy downpours the ground may become saturated and the drains and sewers which carry away surface water may not be able to cope, leading to surface water flooding. |
| Coastal flooding | Coastal flooding is caused by high tides coinciding with a low-pressure storm system which raises sea and tidal water levels (storm surge), overwhelming coastal defences. This may be made worse by gale force winds blowing the raised body of water onto the coast. |
| Partnership funding | In England Partnership funding aims to increase the amount of money available to enable more flood and coastal risk management schemes to go ahead by securing local contributions from those who benefit. It currently seeks to attract 15 per cent from external sources. |
| Community Pathfinder | The Community Pathfinder projects is a two year scheme covering property-level protection, flood resilience groups and volunteer flood wardens. |
| Capital expenditure | Money that is spent on investment and anything that will create growth in the future, i.e the construction of new, improved or refurbished FCERM assets. |
| Resource / revenue expenditure | Money that is spent on day to day resources and administration costs. It includes routine maintenance of flood defences as well as flood mapping, modelling, warning and awareness, emergency planning and response and staff, offices and advice on spatial planning. |
| Revenue / Annual maintenance | Revenue maintenance covers a wide range of activities that includes maintaining and operating flood barriers, gates and pumping stations; clearing trash screens and grills; removing obstructions and sediment from watercourses; inspection and repair of hard FCERM assets such as walls, sluices, culverts and revetments. It also includes preventative operations such as vegetation management in watercourse channels, culverts, banks and flood embankments and management of natural defences such as beaches and shingle ridges. |
| Economic appraisal | In FCERM economic appraisal compares the costs of doing work against the benefits of doing that work in addition to taking into account things that cannot be given a monetary value. |
| Benefit cost ratio | An indicator of whether the benefits outweigh the costs of investing in a scheme. |

| | |
|--------------------------------------|---|
| Outcome measure | Outcome measures are used to prioritise FCERM spending and set targets such as 'x number of homes to be protected'. The absolute targets for each outcome measure are reviewed periodically, typically after spending review periods lasting three or four years to reflect socio-economic circumstances prevalent at the time. |
| System Asset Management Plans (SAMP) | The Environment Agency's long term plans including information on costs for maintaining and replacing assets over their life as well as details of the economic benefits within the system |
| Natural flood risk management | The alteration, restoration or use of natural processes and landscape features as a way of reducing flood risk. |
| Managed realignment | A form of 'soft' engineering. It may involve breaching an existing coastal defence, such as a sea wall or an embankment, and allowing the land behind to be flooded by the incoming tide, setting back the line of actively maintained coastline. This land is then left to be colonised by saltmarsh vegetation. Although a relatively new idea, it is widely recognised that managed realignment can reduce the costs of coastal defence whilst offering numerous environmental benefits. |
| Sustainable drainage systems (SuDs) | Sustainable Drainage Systems are the collective name for approaches that manage surface water that take account of water quantity (flooding), water quality (pollution) and amenity issues. |
| National Flood Forum | The National Flood Forum is a national charity dedicated to supporting and representing communities and individuals at risk of flooding. |
| Flood insurance | Flood insurance is a means of sharing the costs of flooding events between policy holders. Flood risk has long been included as standard in most building and contents insurance policies. As with most types of insurance, policy terms may reflect the level of risk in each case, including actions taken by individuals or risk management authorities to reduce it. |
| Flood Re | Flood Re is a not-for-profit flood reinsurance fund, owned and managed by the insurance industry. It will come into force in August 2015 and under the <i>Water Act</i> will run for a maximum of 25 years to ensure that flood insurance remains affordable. This will replace the previous agreement between the Government and insurance industry to offer cover to most residential properties at risk from flooding (the 'Statement of Principles' agreement). It will automatically cap insurance on eligible homes using a cross-subsidy from other customers. |
| Property level protection (PLP) | Property level protection can fall into two categories. Flood resistance measures, which form a barrier against flood water including air brick, door and window covers and fillers, WC non return valves, retractable water dams, floating water dams. Flood resilience measures, such as replacing carpets with waterproof tiling, raising electricity sockets and appliances above the level of flood waters. |

References

- 1 Environment Agency. 2014. Flood and coastal erosion risk management Long-term investment scenarios (LTIS)
- 2 Adaptation Sub Committee, Committee on Climate Change. 2014. Managing Climate Risks
- 3 Environment Agency. 2014. Flood and coastal erosion risk management Long-term investment scenarios (LTIS) 2014
- 4 Committee on Climate Change. 2012. Is the UK preparing for water scarcity? 3rd progress report
- 5 Met Office. 2014. [Weather statistics](#)
- 6 EFRA Committee. 2013. Managing flood risk. July 2013
- 7 Prime Minister's Office. 2014 Statement UK floods 2014: Government response and recovery
- 8 RSPB. 2014. Flooding in Focus. Recommendations for more effective flood management in England
- 9 EFRA Committee. 2013. Managing flood risk. July 2013
- 10 Flikweert, J. 2014. RSPB Flooding in Focus. Recommendations for more effective flood management in England
- 11 Penning-Rowsell, E.C. 2014. Are we really making progress? Presentation to CIWEM Coastal Flood Incidents Conference 26th November 2014
- 12 Pitt, M. 2008. Learning the lessons from the 2007 Floods. The Pitt Review, Cabinet Office
- 13 Defra. [Archive](#) and Defra. 2011. FCERM strategy
- 14 NHS. 2014. [NHS Principles](#)
- 15 The Conservation (Natural Habitats &c.) Regulations 1994 ISBN 0-11-0457161
- 16 Environment Agency. 2011. Understanding the risks, empowering communities, building resilience. The national flood and coastal erosion risk management strategy for England
- 17 EFRA Committee. 2013. Managing flood risk. July 2013
- 18 DCLG. 2012. National Planning Policy Framework.
- 19 Defra. 2012. Partnership funding and collaborative delivery of local flood risk management: a practical resource for LLFAs
- 20 Metropolis Management (Thames River Prevention of Floods) Amendment Act 1879
- 21 The Flood Risk Management (Scotland) Act 2009. Flood protection schemes, guidance for local authorities. Chapter 5 Project appraisal: assessment of economic, environmental and social impacts
- 22 The Water Environment (Floods Directive) Regulations (Northern Ireland) 2009
- 23 Defra. 2011. FCERM strategy
- 24 Environment Agency. 2014. Flood and coastal erosion risk management Long-term investment scenarios (LTIS)
- 25 Defra. 2015. Central Government Funding for Flood and Coastal Erosion Risk Management in England
- 26 Defra. 2015. Central Government Funding for Flood and Coastal Erosion Risk Management in England
- 27 Defra. 2014. [Funding for flood and coastal erosion risk management](#)
- 28 Royal Haskoning DHV for Defra. 2014. Funding Flood and Coastal Erosion Risk Management Maintenance: Learning from Existing and Past Practice
- 29 Water Resources Act 1991. [Section 135 onwards](#)
- 30 Defra. 2015. Central Government Funding for Flood and Coastal Erosion Risk Management in England
- 31 Defra. 2015. Central Government Funding for Flood and Coastal Erosion Risk Management in England
- 32 Committee on Climate Change Adaptation Sub Committee. 2014. Policy note: flood and coastal erosion risk management spending

-
- 33 National Audit Office. 2013. Flood Risk Management in England – an update of progress for the House of Commons EFRA Committee
- 34 Defra. 2014. *Reducing the threats of flooding and coastal change*. Published 18/12/14
- 35 Bennett, O. 2014. Flood defence spending in England. House of Commons Library
- 36 Defra. 2015. Central Government Funding for Flood and Coastal Erosion Risk Management in England
- 37 EFRA Committee. 2014. Winter Floods 2013/14
- 38 National Audit Office. 2013. Flood Risk Management in England – an update of progress for the House of Commons EFRA Committee
- 39 Environment Agency. 2013. Managing food and coastal erosion risks in England: 1 April 2013 to 31 March 2014. Report by the Environment Agency
- 40 EFRA Committee. 2013. Managing flood risk, July 2013
- 41 For example Hansard from MPs debate the 2013-14 winter floods, 08/01/2015
- 42 Government response to EFRA managing flood risk. October 2013
- 43 Defra. 2013. Press release 27 June 2013 Flood insurance agreement reached
- 44 Environment Agency. 2013. Written evidence on flood funding to EFRA Committee
- 45 Defra. 2009. Appraisal of FCERM Policy
- 46 Environment Agency. 2013. Written evidence on flood funding to EFRA Committee
- 47 Environment Agency. 2011. Flood and Coastal Erosion Risk Management Outcome Measures
- 48 Environment Agency. 2006. Addressing Inequalities: Flood Risk
- 49 Sarah Lindley *et al.* 2011. Climate change, social justice and vulnerability. Joseph Rowntree Foundation
- 50 Joseph Rowntree foundation. 2015. *Climate Just website*
- 51 Environment Agency. 2014. Calculate Grant in Aid funding for flood and coastal erosion risk management projects, *guidance for risk management authorities*
- 52 Environment Agency. 2014. Written evidence on flood funding to the EFRA Committee
- 53 Defra. 2015. The new Common Agricultural Policy schemes in England: February 2015 update
- 54 Defra. 2014. Reducing the risks of flooding and coastal erosion. An investment plan December 2014
- 55 Middlesex University. 2013. Multi-coloured Manual. London Flood Hazard research centre. Routledge
- 56 Environment Agency. 2013. Managing food and coastal erosion risks in England: 1 April 2010 to 31 March 2013. Report by the Environment Agency
- 57 HM Treasury. 2014. The Green Book: appraisal and evaluation in central Government
- 58 Environment Agency. 2011. *How we review the maintenance of flood risk management assets*
- 59 National Audit Office. 2014. Strategic Flood Risk Management. Report by the Comptroller and Auditor General Ordered by the House of Commons to be printed on 4 November 2014
- 60 Bennett, O. 2014. Flood Defence spending in England. House of Commons Library
- 61 National Audit Office. 2014. Strategic Flood Risk Management
- 62 National Audit Office. 2014. Strategic Flood Risk Management
- 63 Environment Agency. 2013. *Protocol for the maintenance of flood and coastal risk management assets*
- 64 Pitt, M. 2008. Learning the lessons from the 2007 Floods. The Pitt Review, Cabinet Office
- 65 Defra. 2011. FCERM Strategy
- 66 Shamier, N. 2014. Flood risk funding options in the UK; present and future. Unpublished manuscript
- 67 Defra. 2012. Solutions for joint funding water schemes
- 68 Royal Haskoning DHV for Defra. 2014. Funding Flood and Coastal Erosion Risk Management Maintenance: Learning from Existing and Past Practice

-
- 69 Defra. 2013. The future funding outlook. Presentation to CIWEM's 2013 Rivers and Coastal Group conference
- 70 Environment Agency. 2014. Policy paper: *Sandwich town tidal defences*
- 71 Anglian Water. 2014. Major project to protect Louth homes from flooding. *Press release*. 31 July 2014
- 72 BIS. 2012. *Boosting private sector employment in England*
- 73 Leeds City Region Local Enterprise Partnership. 2012. LEP secures over £30m for local businesses. Press release: 19/10/12
- 74 The Community Fund. 2015. <http://www.thecommunityfund.co.uk>
- 75 Government Office for Science. 2004. Foresight Future Flooding
- 76 EFRA Committee. 2013. Managing flood risk
- 77 Environment Agency. 2014. Flood and coastal erosion risk management Long-term investment scenarios (LTIS)
- 78 IPCC United Nations Intergovernmental Panel on Climate Change. 2013. Summary for Policymakers: The Physical Science Basis. Contribution of Working Group I to the IPCC Fifth Assessment Report
- 79 IPCC United Nations Intergovernmental Panel on Climate Change 2014 Climate Change 2014 Synthesis Report Summary for policy makers
- 80 Committee on Climate Change Adaptation Sub Committee. 2014. Managing climate risks to well-being and the economy. Adaptation Sub-Committee Progress Report 2014
- 81 Defra. 2011. FCERM strategy
- 82 National Audit Office. 2014. Strategic Flood Risk Management
- 83 Penning-Rowsell, E.C. 2014. Flood risk management policy today. Presentation on 30th Sept 2014
- 84 Penning-Rowsell, E.C. The 2013/14 floods: what do they tell us about overall flood risk in England and Wales?
- 85 Harris Interactive 2013 for the Environment Agency, via Committee on Climate Change Adaptation Sub Committee. 2014. Managing climate risks to well-being and the economy. Adaptation Sub-Committee Progress Report 2014
- 86 Government Office for Science. 2014. *Foresight Future Flooding*
- 87 Environment Agency. 2009. Long Term Investment Strategy
- 88 National Audit Office. 2011. Flood risk management in England. NAO, London
- 89 ASC (Adaptation Sub-Committee). 2012. Climate change – is the UK prepared for flooding and water scarcity? Committee on Climate Change, London
- 90 Penning-Rowsell E.C. 2014. A realistic estimate of flood risk in England and Wales. Transactions of the Institute of British Geographers
- 91 Environment Agency. 2014. Flood and coastal erosion risk management Long-term investment scenarios (LTIS)
- 92 Defra. 2014. Reducing the risks of flooding and coastal erosion: An investment plan
- 93 Environment Agency. 2014. Flood and coastal erosion risk management Long-term investment scenarios (LTIS) 2014. Appendix B Economic Framework
- 94 Environment Agency. 2014. Flood and coastal erosion risk management Long-term investment scenarios (LTIS)
- 95 Environment Agency. 2014. Flood and coastal erosion risk management Long-term investment scenarios (LTIS)
- 96 Defra. 2014. Reducing the risks of flooding and coastal erosion: An investment plan
- 97 Defra. 2014. *Defra funding for flood and coastal erosion risk management*
- 98 Environment Agency. 2009. Long term investment strategy and Environment Agency. 2014. Flood and coastal erosion risk management Long-term investment scenarios (LTIS) 2014
- 99 Committee on Climate Change Adaptation Sub Committee. 2014. Managing climate risks to well-being and the economy. Adaptation Sub-Committee Progress Report 2014
- 100 The Law Society. 2014. Flood Risk Practice note: 18 December 2014
- 101 Environment Agency. 2014. Flood and coastal erosion risk management Long-term investment scenarios (LTIS)

-
- 102 Defra. 2014. Flood and Coastal Erosion Resilience Partnership Funding Evaluation final report
- 103 Defra. 2014. Presentation to CIWEM conference 30th January 2014 - Evaluation of the early impacts of the approach
- 104 National Audit Office. 2014. Strategic Flood Risk Management
- 105 Defra. 2014. Flood and Coastal Erosion Resilience Partnership Funding Evaluation final report
- 106 HM Revenue and Customs. 2014. Income tax and corporation tax: tax relief for businesses contributing to a partnership funding flood defence scheme
- 107 Committee on Climate Change Adaptation Sub Committee. 2014. Managing climate risks to well-being and the economy. Adaptation Sub-Committee Progress Report 2014
- 108 Environment Agency. 2014. Annual report and accounts for the financial year 2013 to 2014
- 109 Environment Agency. 2014. Annual report and accounts for the financial year 2013 to 2014
- 110 National Audit Office. 2014. Strategic Flood Risk Management
- 111 Adaptation Sub Committee, Committee on Climate Change. 2014. Managing Climate Risks
- 112 National Audit Office. 2014. Strategic Flood Risk Management
- 113 Royal Haskoning DHV for Defra. 2014. Funding Flood and Coastal Erosion Risk Management Maintenance: Learning from Existing and Past Practice
- 114 Environment Agency. 2014. Managing flood and coastal erosion risks in England: 1 April 2013 to 31 March 2014
- 115 Committee on Climate Change. 2014. Policy note: flood and coastal erosion risk management spending
- 116 Defra. 2014. Flood and Coastal Erosion Resilience Partnership Funding Evaluation final report
- 117 Local Government Association. 2011. Framework to assist the development of the Local Strategy for Flood Risk Management 'A Living Document'
- 118 Committee on Climate Change. 2014. New long-term investment scenarios point to the need for much greater flood resilience, Blog post 5 December 2014
- 119 Penning-Rowsell, E.C. 2014. Are we really making progress? Presentation to CIWEM Coastal Flood Incidents Conference 26th November 2014
- 120 Defra. 2011. FCERM strategy
- 121 Environment Agency. 2013. Managing flood and coastal erosion risks in England: 1 April 2012 to 31 March 2013
- 122 Environment Agency. 2014. Flood and coastal erosion risk management Long-term investment scenarios (LTIS)
- 123 Committee on Climate Change Adaptation Sub Committee. 2014. Managing climate risks to well-being and the economy. Adaptation Sub-Committee Progress Report 2014
- 124 Environment Agency. 2014. Flood and coastal erosion risk management Long-term investment scenarios (LTIS) 2014
- 125 Committee on Climate Change. 2012. Is the UK preparing for water scarcity? 3rd progress report
- 126 Committee on Climate Change. 2015. Designing Flood Re to encourage flood risk reduction. Letter to Brendan McCafferty from Lord Krebs, 3rd February 2015