



Department
for Environment
Food & Rural Affairs

Flood and coastal erosion risk management

An investment plan for 2021 to 2027

Date: 29 July 2021

We are the Department for Environment, Food and Rural Affairs. We're responsible for improving and protecting the environment, growing the green economy and supporting our world-class food, farming and fishing industries.

We work closely with our 33 agencies and arm's length bodies on our ambition to make our air purer, our water cleaner, our land greener and our food more sustainable. Our mission is to restore and enhance the environment for the next generation, and to leave the environment in a better state than we found it.



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Foreword from the Secretary of State

The impact of Storm Christoph earlier this year reminds us all that flooding and coastal erosion can have devastating impacts – affecting people, their homes, communities and livelihoods. This is why we continue to invest and take action to better protect and better prepare our communities from flooding and coastal erosion. While we saw around 700 properties flooded from Storm Christoph, our network of flood defences protected 49,000 properties.

The government's record investment in flood and coastal defences is an important part of protecting the country. We have doubled the amount the government invests in the flood and coastal defence programme in England to £5.2 billion over the next 6 years. This will be invested in around 2,000 new defence schemes which will better protect 336,000 properties by 2027.

This Investment Plan sets out what we expect to achieve from this 6-year programme, how we will develop our portfolio of projects and how we will manage the investment and track its progress. By creating visibility and confidence in our pipeline of future projects, the flood and coastal defence programme will help the country to build back better, faster and greener from the COVID-19 pandemic. It will benefit all areas of England – including communities that have experienced frequent flooding in the past – contribute to the national economy and avoid the wider and local economic damages that arise from flooding and coastal erosion.

We will build on the successes of our first 6-year investment programme for England – the 2015 to 2021 programme. Through the effective action of those managing flood and coastal erosion risk in England, including the Environment Agency, Regional Flood and Coastal Committees, local councils, Internal Drainage Boards, water companies and others, we have surpassed our target of better protecting 300,000 homes by March 2021.

We need to continue to work together to achieve even more – government, individuals, public bodies, local communities, the private sector and those responsible for infrastructure. This will help us to achieve our ambitious targets for the new flood and coastal defence investment programme and help us to improve our resilience as a nation and better protect homes, businesses and families across the country from the devastating impacts of flooding and coastal erosion.

Rt Hon George Eustice MP

Secretary of State for Environment, Food and Rural Affairs

Executive summary

The risks from flooding and coastal erosion are significant and continue to grow. In July 2020, the government published its long-term vision to create a nation more resilient to flood and coastal erosion risk in the [Flood and Coastal Erosion Risk Management Policy Statement](#).

The amount invested in the new 6-year investment programme in England has doubled to £5.2 billion for 2021 to 2027. This will better protect 336,000 properties and is forecast to reduce national flood risk by up to 11% by 2027. It will help to avoid £32 billion of wider economic damages. The programme will invest in around 2,000 new defence schemes.

These projects will benefit both urban and rural communities and will help to better protect against a range of flood risk sources and coastal erosion, building build back better in the wake of the COVID-19 pandemic. It will improve resilience to flood and coastal erosion risk throughout England and help to stimulate the economy in all parts of country. This will make sure no region is left behind as we achieve greater economic prosperity.

Partnership Funding from local communities and the private sector will be important in delivering our objectives. Over the course of the 6-year programme, it is expected that between £310 and £610 million of Partnership Funding contributions will be secured and invested, less than was required for the previous investment programme given the higher levels of government investment in this programme.

The new investment programme builds on the successes of the first 6-year investment programme for England, which saw the government invest £2.6 billion in new flood defences, surpassing its target of better protecting 300,000 homes by March 2021.

As well as developing new schemes, it is crucial that we also invest in maintaining and operating our existing defences. We will continue to invest in maintenance over the next 6 years. Additional funding has been made available to the Environment Agency for that in 2021 to 2022.

Investment in flood and coastal defences over the course of the 2021 to 2027 programme will exceed recommended minimum levels. All anticipated capital and revenue investment sources will collectively exceed the average optimum investment level identified by the [Environment Agency's Long-Term Investment Scenarios](#) (LTIS), which reflect longer term investment needs. All anticipated capital sources between 2021 and 2027 will also exceed

the minimum required to maintain resilience, as estimated by the National Infrastructure Assessment¹.

Our 6 year funding commitment allows the Environment Agency to unlock further efficiencies in project delivery. This means that approximately £520 million of efficiency savings will be reinvested into the programme by 2027.

¹ National Infrastructure Commission (2018). National Infrastructure Assessment.

Introduction

Flooding and coastal erosion can be devastating. As well as the potential for loss of life and damage to property, they can impact our businesses and livelihoods, and affect our health and wellbeing. The risks we face are significant and continue to grow. Climate change is leading to rising sea levels and warmer and wetter winters, together with an increase in the frequency and intensity of extreme events such as heavy rainfall, coastal erosion and landslips.

In July 2020 the government published its long-term plan to create a nation more resilient to flood and coastal erosion risk in its [Flood and Coastal Erosion Risk Management Policy Statement](#). Representing the most substantive update to floods policy in a decade, this plan sets out the government's vision to better protect and better prepare the country. Alongside the Policy Statement, the Environment Agency published its updated [National Flood and Coastal Erosion Risk Management Strategy for England](#).

At the heart of the government's approach is a commitment to upgrade and expand the country's national flood defences and infrastructure. We have already better protected more than 300,000 homes since 2015 and now we are doubling our investment, with £5.2 billion to be invested in a new 6-year capital investment programme running between 2021 and 2027.

Additionally, the government announced in July 2020 a further £170 million to accelerate the building of 22 shovel-ready defence schemes across the country – all of which will start construction before the end of March 2022. This will drive growth and unlock benefits for local economies, including better protecting more than 10,000 local businesses and safeguarding around 100,000 jobs.

The level of investment in flood and coastal erosion risk management underpins the government's wider approach to build back better, faster and greener – as described in the recently published [National Infrastructure Strategy](#) and [Build Back Better: our plan for growth](#). It will improve resilience to flood and coastal erosion risk throughout England as well as boost the economy in all parts of the country, including places which have experienced recent and frequent flooding. It will help to stimulate economic activity in the wake of the COVID-19 pandemic and contribute to levelling up across the UK.

Beyond the £5.2 billion investment programme, the government is investing in other actions that support flood and coastal erosion risk management, including the £200 million [flood and coastal resilience innovation programme](#). This programme will support 25 local areas across the country to test innovative actions to improve resilience to flooding and coastal erosion. It will also pilot 4 long-term investment pathways – in the Thames Estuary, Humber Estuary, Yorkshire and Severn Valley – to trial and develop ways of planning ahead and making wise investment choices for the decades to come in face of the long-term uncertainties brought by climate change.

In addition, the £640 million Nature for Climate fund and the Environmental Land Management scheme will harness the power of nature in the fight against flooding – actions such as tree planting and habitat creation will slow and hold water. The detail of these schemes is not covered in this Investment Plan which focuses on flood and coastal defence schemes.

The government's new 6-year investment programme is therefore one of a number of sources of investment in flood and coastal defences in England. Reflecting all anticipated capital and revenue investment sources, including the new investment programme, investment in flood and coastal defences in England between 2021 and 2027 will exceed the average optimum investment level identified by the [Environment Agency's Long-Term Investment Scenario](#) (LTIS). LTIS sets out the total national level of investment for flood and coastal risk management over the next 50 years and estimates that this level is a long-term annual average of £1 billion.

Furthermore, reflecting all anticipated capital investment sources, again including the new investment programme, investment in flood and coastal erosion risk management between 2021 and 2027 will also exceed the level described by the National Infrastructure Assessment² to respond to a low population growth, medium climate change scenario. This Assessment estimates a range in average annual capital cost of between £0.6 billion and £1.3 billion³ to maintain resilience depending on population growth and climate change scenarios.

This Investment Plan details what the government's new 6-year investment programme will deliver, including how the portfolio of projects will be developed to upgrade and expand the country's flood and coastal defences. It also sets out how the government will manage the investment and track its progress. It builds on the successes of the government's first 6-year investment programme for England – the 2015 to 2021 programme – which surpassed its target of better protecting 300,000 homes by March 2021. Further information on how this programme was delivered is provided in Annex A.

² National Infrastructure Commission (2018). National Infrastructure Assessment.

³ £0.6 million under a low population and medium climate change scenario and £1.3 million under a high population and high climate change scenario.

The new 2021 to 2027 flood and coastal defence investment programme

What we will achieve

The government's £5.2 billion investment in the new 2021 to 2027 programme will better protect 336,000 properties including homes and non-residential properties such as shops, business and industrial premises, schools, hospitals, transport links and utility sites (such as electricity substations). Around 2,000 flood and coastal defence projects are planned to be invested in, which will avoid the considerable disruption caused by potential future flooding to the daily lives of over 4 million people.

This investment aims to better protect 550 kilometres of road and rail infrastructure, create or improve 5,440 hectares of natural habitat and enhance 830 kilometres of rivers.

This programme of flood and coastal defence projects is forecast to reduce current levels of national flood risk by up to 11% by 2027, helping to avoid £32 billion of wider economic damages. Furthermore, by lowering the risk of flooding and coastal erosion, it will make better protected areas more attractive to investors which will support local and national economic and productivity growth.

2,000 projects planned for the programme

The 2021 to 2027 programme is made up of projects developed and promoted by local authorities, internal drainage boards and the Environment Agency. It has been created in liaison with communities and with the agreement of Regional Flood and Coastal Committees⁴.

The majority of the 2,000 schemes will be completed between April 2021 and March 2027. Around 200 of these schemes are already in their construction phase. This early achievement has partly been made possible by the acceleration of £100 million of funding from the new programme into the final year of the previous programme – ensuring that the transition between the two investment plan periods does not impede scheme development and delivery.

⁴ Regional Flood and Coastal Committees co-ordinate risk management authorities to ensure plans are in place to manage flood and coastal erosion risks, make local choices and agree programmes for their areas.

Figure 1: better protecting communities frequently flooded in the Irwell Catchment

Communities along the River Irwell in Kearsley, Bolton have flooded twice since Christmas 2015, with some properties flooded up to a depth of 1.5 metres. The Environment Agency is leading a major programme of works to better protect communities in the wider Irwell Catchment – from Rochdale and Littleborough in the north, Radcliffe and Redvales in the west to Salford in the south.

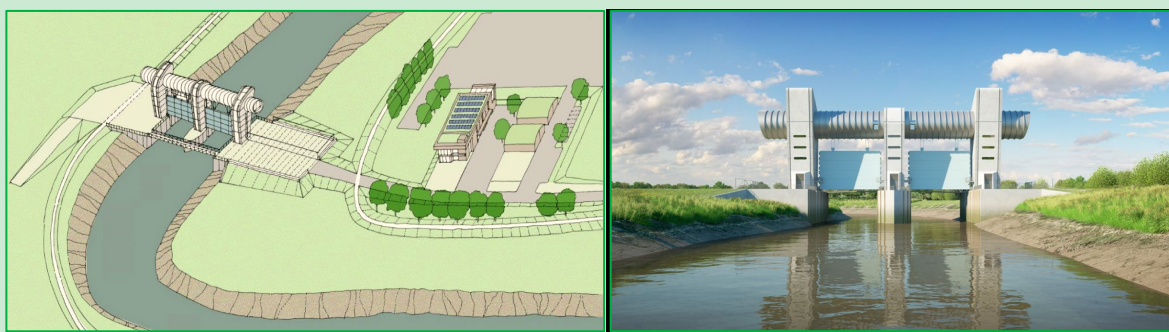
Work is due to complete in 2023 to 2024 and will better protect 80 residential properties. The government’s flood defence grant in aid will contribute approximately £2 million to the scheme with a local levy raising £0.6 million.



Photograph courtesy of Zephyr Drone Services

Figure 2: the Bridgwater Tidal Barrier scheme – supporting the sustainable growth of the town

The Environment Agency and Sedgemoor District Council have been working together to develop proposals for a £100 million tidal surge barrier project to reduce flood risk and provide long-term tidal flood protection to Bridgwater and downstream villages.



This barrier will be a vertical lift gate structure designed to close when a surge tide is expected and will prevent the tide travelling upstream and overtopping defences. The scheme will better protect more than 11,000 homes and 1,500 businesses from tidal flooding and is important to support the sustainable growth and development of the town. Building of the barrier is expected to start in 2023.

The schemes not yet in construction are being appraised and designed. These will be delivered over the later years of the investment programme, and some beyond 2027. This means that the investment programme can be a rolling programme of schemes which aims to make the right investment at the right time to manage risk, replace assets as needed and offer communities better protection and resilience.

Maintaining this long-term pipeline of projects also enables schemes to be developed in collaboration with suppliers and partners – unlocking efficiencies in delivery and encouraging additional funding from other public and private sources. Figure 3 shows the locations of schemes that will receive investment in the first year (2021 to 2022) of the investment programme. It does not show the locations of all 2,000 projects that will be invested in over the course of the programme.

The details of the schemes shown in Figure 3 are published alongside this document on an interactive map on GOV.UK – this interactive map will be updated annually as the programme progresses. These regular updates provide communities with visibility on the progress of their schemes. Understanding the details of these projects also enables greater planning and partnership opportunities with other infrastructure programmes – providing further opportunities to maximise efficiencies in programme delivery.

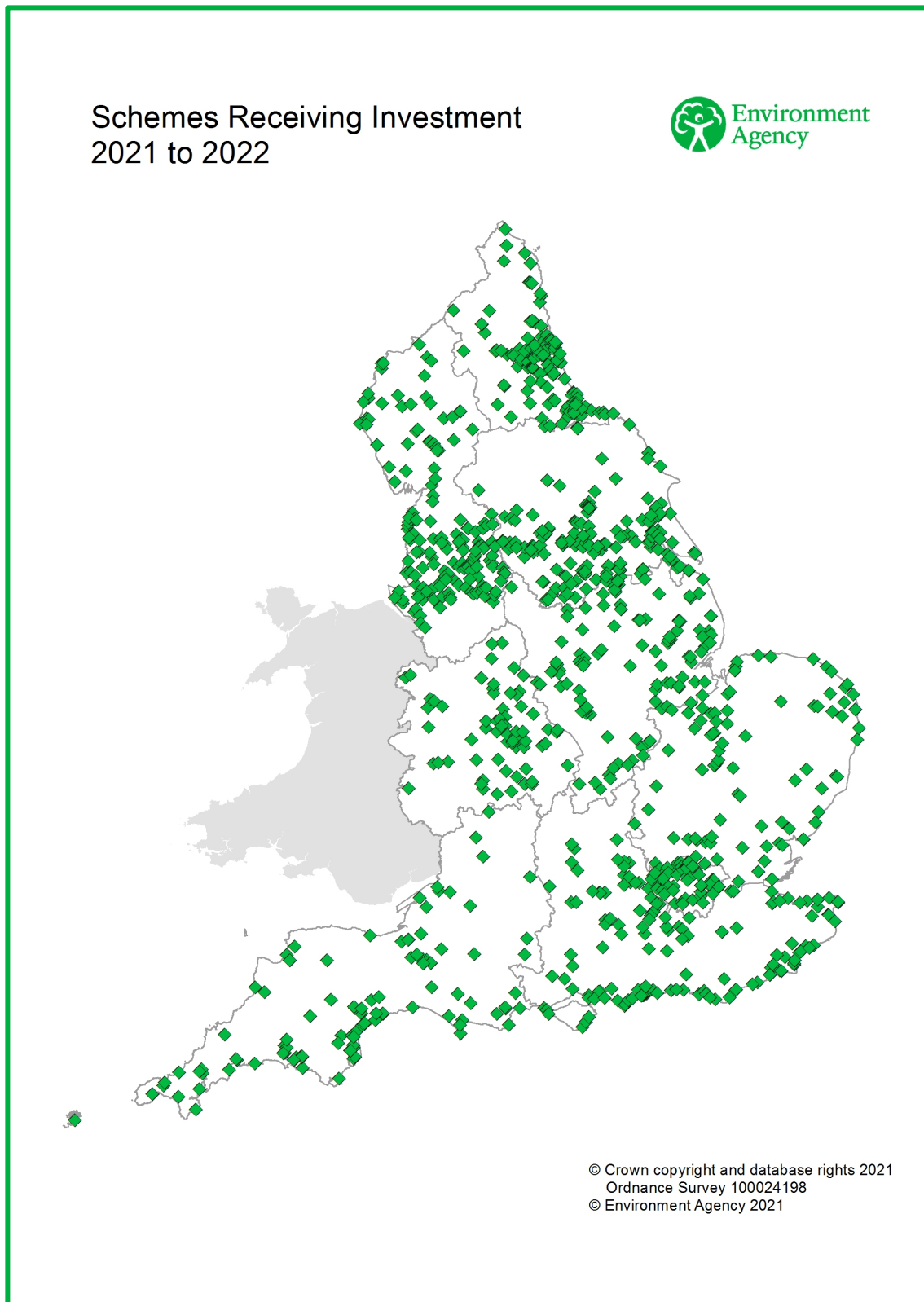
The programme will benefit both urban and rural communities and will help to better protect against a range of flood risk sources. Of the total number of projects in the programme, approximately 49% will better protect against river flooding, 34% from surface water flooding and 17% from coastal and tidal flooding. We expect investment in surface water projects to grow as more investigations are carried out locally and more proposed projects come forward. At the 2018 Autumn Statement the government provided grant funding totalling £2 million to improve mapping data from successful lead local flood authorities. Working closely with lead local flood authorities, through the Boosting Action on Surface Water Projects, the Environment Agency has provided grants to 28 lead local flood authorities in 2019 to 2020 to improve surface water mapping.

Natural flood management measures are also a component of some of the schemes in the programme. Natural flood management measures can have an impact in slowing the flow of water downstream, store flood water and contribute to river restoration and coastal adaptation. Actions can include tree planting, peatbog restoration and the management of coastal marsh and sand dune systems. The Flood and Coastal Erosion Risk Management Policy Statement commits to a doubling in the number of government funded projects which include nature-based solutions to reduce flood and coastal erosion risk. Changes made to the formula for allocating funding for flood and coastal defence schemes across England increase payments for flood schemes which also create certain environmental benefits⁵. The Environment Agency's National Flood and Coastal Erosion Risk

⁵ See Figure 8 and the section on **Continuous Improvement** for more information on these changes.

Management Strategy for England also includes an action that Risk Management Authorities (RMAs) will use nature based solutions and improve the environment through their investments in flood and coastal resilience.

Figure 3: projects that will receive investment in the first year (2021 to 2022) of the flood and coastal defence investment programme



The programme also harnesses opportunities for water storage and water management to manage peak flows and provide flood risk benefits. An example of such a scheme is illustrated in Figure 5.

Figure 4: natural flood management as part of the Kendal flood alleviation scheme

The Environment Agency is working with South Lakeland District Council, Cumbria County Council, United Utilities and other stakeholders to better protect 1,480 homes and over 1,000 businesses as part of Kendal's £75 million flood alleviation scheme.

The scheme includes natural flood management measures including planting over 3,600 trees and supporting 'slow the flow' measures in the upper catchment, including peatland restoration. Construction of the scheme is underway and is due to be completed by 2026.



Figure 5: water storage as part of the Leeds Flood Alleviation scheme (Phase 2)

The second phase of the £160 million Leeds Flood Alleviation scheme aims to better protect Leeds from flood risk from the River Aire, helping to stimulate growth in local and wider economies. It is being led by Leeds City Council who are working in partnership with the Environment Agency. The scheme is programmed to be completed by 2023.

It consists of raised defences with a large upstream flood storage area. It also includes a natural flood management component which will provide carbon sequestration in addition to habitat, biodiversity and water quality improvements.



Table 1 summarises how the forecast range of investment is spread across England's regions. This forecast is subject to change as the programme develops. Every English region is forecast to receive more investment in flood and coastal defences in this programme compared to the previous 2015 to 2021 investment programme, demonstrating our commitment to building back better.

Funding is consistently distributed across the country wherever the risk is greatest and the benefits are highest (as set out in the government's Partnership Funding policy described in the section on [Allocating the Investment](#)). The number of communities and properties at greatest risk of flooding, the opportunities for delivering schemes and the type of project will all influence the regional distribution of investment. Those regions with large schemes in construction during the programme – such as the Thames Estuary Asset Management project in the South East, Bridgwater Tidal Barrier Flood Defence Scheme in the South West and Leeds Flood Alleviation Scheme Phase 2 in Yorkshire and the Humber – have relatively high indicative ranges of investment over the programme.

Information on these projects and examples of others that are planned to be delivered across each region of the country are summarised below.

Table 1: forecast indicative range of investment across the country 2021 to 2027

Region	Forecast indicative range of investment (£m)
East Midlands	380 to 460
East of England	510 to 620
London	290 to 350
North East	240 to 290
North West	620 to 750
South East	830 to 1,010
South West	740 to 890
West Midlands	220 to 270
Yorkshire and The Humber	680 to 830

Region	Forecast indicative range of investment (£m)
Cross-region and national ⁶	190 to 230

East of England

Benacre and Kessingland Flood Risk Management Scheme: replacing an existing pumping station and flood defence embankment along a more sustainable alignment. This will create new intertidal habitat and the potential for new publicly accessible open space.

East Midlands

Saltfleet to Gibraltar Point Beach Management: this beach replenishment scheme sees sand dredged from licensed areas of the seabed pumped onto the beaches between Saltfleet and Gibraltar Point, to replace levels naturally lost to the sea throughout the year. Replenishing the sand means the beaches – instead of hard defences like sea walls – take the brunt of the waves' force and energy.

This reduces the amount of damage and erosion to those hard defences – and lessens the risk of water overtopping them. It helps protect 20,000 homes and businesses, 24,500 static caravans and 35,000 hectares of land from flooding.

London

Thames Estuary Asset Management: this programme is refurbishing and replacing tidal flood defences in London and the Thames estuary. Defences include the Thames Barrier and 350 kilometres of flood walls and embankments, smaller barriers, pumping stations and flood gates. The system of defences currently protects 1.25 million people and £200 billion of property.

North East

Hartlepool Marina Study and Construction (North Pier): this project consists of installing sheet piling and cladding to the inner marina walls. It will better protect around 350 homes in addition to restaurants and bars in the vicinity.

⁶ Cross-region and national investment supports local project delivery, including vehicles and equipment to maintain assets and respond to flood events, and enhancing flood forecasting and warning services.

North West

Blackpool Beach Nourishment Scheme: this scheme is being undertaken by Blackpool Borough Council. It will maintain the standard of protection for properties currently better protected by sea defences in addition to maintaining the amenity value of the beach.

South East

Southsea Coastal Flood and Erosion Risk Management Scheme: replacing existing flood defences to better protect significant numbers of residential and commercial properties and infrastructure in Southsea.

South West

Bridgwater Tidal Barrier Flood Defence Scheme: a new tidal surge barrier on the River Parrett between Chilton Trinity and Express Park together with new and improved downstream defences. This will improve the standard of protection from tidal flooding to over 10,000 properties in Bridgwater and surrounding areas.

West Midlands

Fowlea Brook Flood Risk Management Scheme: a scheme to better protect over 200 properties in Stoke-on-Trent. It will also renaturalise a 150 metre section of Fowlea Brook through a brownfield site, unlocking 6.5 kilometres of the brook to fish passage.

Yorkshire and the Humber

Leeds Flood Alleviation Scheme Phase 2: a combination of traditional engineering methods and Natural Flood Management will be used to reduce flood risk in Leeds. Phase 2 of the Leeds Flood Alleviation Scheme will better protect over 1,000 homes and almost 500 businesses.

Allocating the investment

As set out above, the amount of funding a project can attract will depend on the damages it will avoid and the benefits it will deliver. The benefits that determine the grant in aid available for a project are mainly those benefits to people and property that result from reduced flood and coastal erosion risk.

Where the grant in aid does not cover the full costs of the project, contributions will be needed from local partners, the local community or other organisations or businesses that will benefit from the scheme. Securing this Partnership Funding is central to the delivery of the majority of projects. Over the course of the 6-year programme, it is expected that between £310 million and £610 million in Partnership Funding contributions will be

secured and invested to help us achieve the ambitions for the programme. The lower end of this range is less than that required for the first investment programme given the higher levels of government investment in the new programme and the changes announced to the Partnership Funding policy in April 2020 (see section on [Continuous Improvement](#)).

Partnership funding from other government departments

In the previous 2015 to 2021 investment programme, other government departments provided Partnership Funding to schemes that would better protect assets owned or operated by the government – to minimise damage and disruption costs to public buildings and services. For example, as illustrated in Figure 6, the Department for Transport contributed to the Rochdale and Littleborough Flood Risk Management Scheme which will better protect major transport infrastructure such as the tram network and bus interchange.

In recognition of the benefits of better protecting public buildings and services, £400 million of the £5.2 billion invested in the new investment programme will be invested directly in flood schemes which will better protect public infrastructure such as hospitals, schools and transport infrastructure from the risks of flooding and coastal erosion. This investment will boost these schemes, streamline aspects of the Partnership Funding process and increase the overall deliverability of the programme.

Other government departments and agencies will also be able to contribute additional financial contributions on a case-by-case basis, in addition to the £400 million already allocated, to schemes to better protect their assets.

Figure 6: Rochdale and Littleborough Flood Risk Management Scheme

The Rochdale and Littleborough Flood Risk Management Scheme is a £56 million project to better protect 800 properties from flooding from the River Roch and its tributaries. Rochdale and Littleborough are towns in Greater Manchester that were badly flooded on Boxing Day in 2015 during Storm Eva.

The scheme includes 4 flood storage reservoirs along with linear defences. The first phase of the construction works in Littleborough is due to start in spring 2021 with subsequent phases following on downstream in the River Roch catchment.



The Environment Agency is working in partnership with Defra, Rochdale Borough Council, Transport for Greater Manchester, Department for Education, Department for Transport and Network Rail to deliver the project.

Collaborating with stakeholders

A broad range of stakeholders are involved in developing and delivering schemes within the programme. They range from the communities that are being better protected, local infrastructure providers, local businesses, landowners, farmers, environmental groups and more. Consultation and collaboration with these stakeholders are important to make sure we make the right investment for those affected by flooding and coastal erosion.

Around half of the schemes in the 2021 to 2027 investment programme will be delivered by RMAs other than the Environment Agency, including local authorities, internal drainage boards, water companies and lead local flood authorities. The Environment Agency will continue to support RMAs through workshops and training on the latest techniques to build good partnerships and secure contributions. They are also supported with expert advice on specific projects.

Regional Flood and Coastal Committees also play a critical role in delivering the investment programme in their region. They consent the Environment Agency's proposed programme funded through grant in aid, taking into account local priorities, and assign additional funding through their Local Levy, raised from local authorities. The Committees bring together RMAs from across the region to support the management of flood and coastal erosion risks. They also co-ordinate with all RMAs to ensure plans are in place to manage these risks and agree further investment.

Operation, maintenance and support programmes

How we maintain the country's defences

An important part of effectively managing flood and coastal erosion risk is making sure our existing defence assets are maintained and able to operate. This ensures they reliably and effectively deliver their designed levels of protection – ensuring our communities are better protected from the disruption and damages flooding can cause.

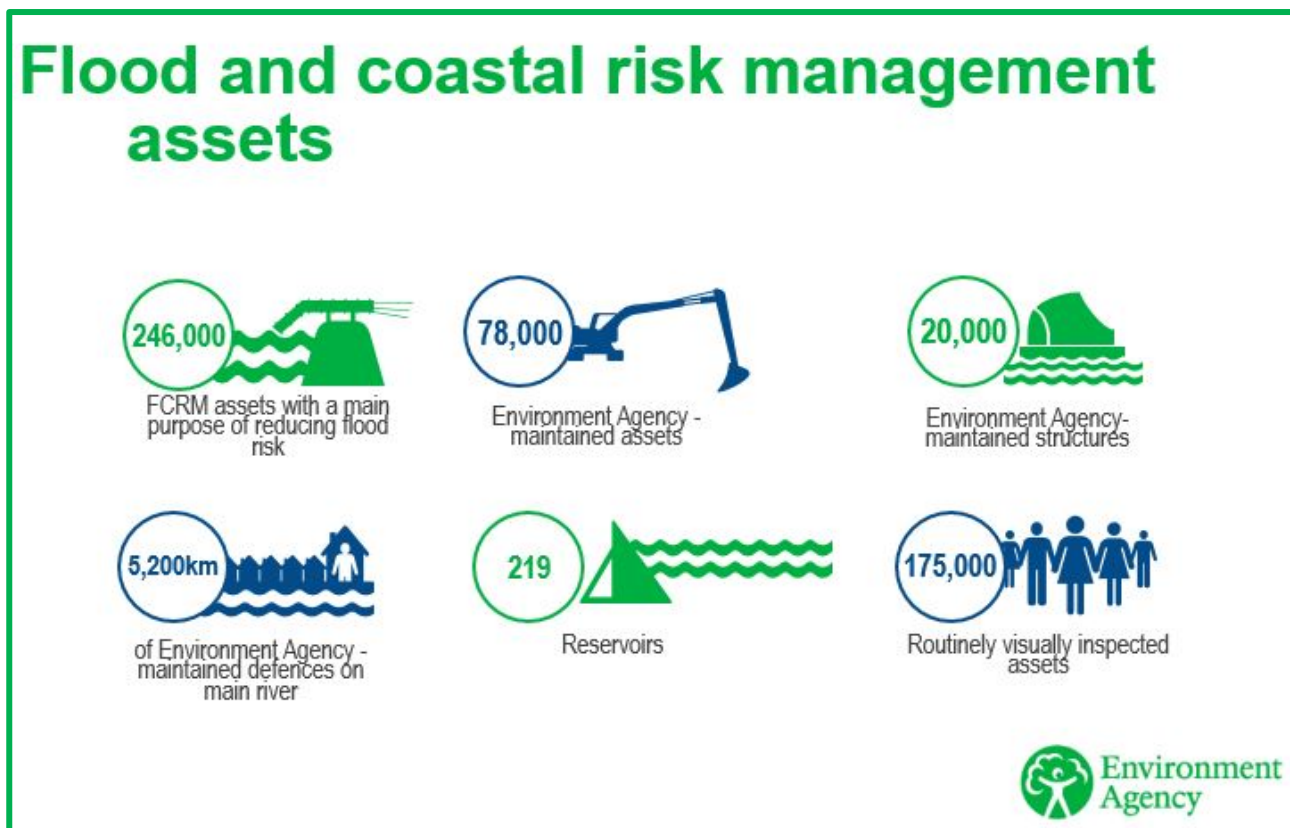
There are different forms of flood defence assets – from flood and sea walls and embankments, to pumping stations and flood storage areas. Many of these are maintained by Risk Management Authorities (RMAs). Private individuals, organisations and riparian owners also have responsibilities for maintaining their assets.

While ownership of assets and maintenance responsibilities vary across these organisations, everyone has their part to play. The Policy Statement on Flood and Coastal Erosion Risk Management sets out the government's long-term approach to maintaining our network of defences across the country and ensuring that those responsible for assets invest in their ongoing maintenance. We have committed, by the end of 2021, to commence a review of the statutory powers and responsibilities to map, monitor, inspect and maintain all assets – to make sure responsibilities are clear and effective powers are in place to enable inspection and maintenance to be undertaken.

The Environment Agency is responsible for operating, maintaining and replacing 78,000 existing flood and coastal defence assets. Together these have a total value of £25 billion and reduce the risk of flooding to 1.8 million households, providing an estimated reduction in annual average flood damages of £2.8 billion. The variety of assets in the Environment Agency's portfolio is summarised in Figure 7.

The Environment Agency groups assets into 'systems' that are considered high, medium or low consequence based on their contribution in reducing flood risk. Their optimum target for the high consequence assets is that 98% are in 'good' condition. Alongside this the Environment Agency also has responsibility for maintaining our main rivers in such a way that flood risk is not exacerbated locally or elsewhere.

Figure 7: England's flood and coastal risk management assets



There are 4 broad categories of activities that are undertaken in managing defence assets:

- conveyance: over £30 million in 2021 to 2022 will be invested in the routine management of channels and culverts to ensure rivers can flow freely, including clearing overgrown vegetation, dredging and removing obstructions
- operation and incident management: over £70 million will be invested in 2021 to 2022 in operating assets during high flows such as closing flood gates, installing temporary barriers and operating pumps. This includes emergency works to assets damaged by flooding
- structures and defences: around £30 million will be invested in 2021 to 2022 in planned maintenance of defences to extend their life and ensure they perform to designed standards, such as replacing seals in flood gates or repointing masonry culverts to prevent collapse
- mechanical and electrical instrumentation, control and automation (MEICA): nearly £40 million will be invested in 2021 to 2022 in controlling assets such as pumps, tidal barriers and site control systems to manage water flow and water storage

How we will invest in maintaining our country's defences

The government recognises the importance of maintaining existing flood defence assets and ensuring there is revenue funding for this purpose. Between 2015 and 2020, the government significantly increased funding over this period for the maintenance of flood and coastal erosion risk management assets and wider maintenance. In addition, the March 2020 budget provided the Environment Agency with an additional £120 million of funding for 2020 to 2021, to repair assets damaged following Storms Ciara and Dennis in early 2020. This additional funding alone will deliver 610 projects across England, returning assets to their required condition.

We will continue to provide revenue investment to the Environment Agency to fund the day-to-day operation and maintenance of their existing flood and coastal defence assets over the next 6 years. Following the 2020 Spending Review, the government is increasing the amount it invests in maintenance for 2021 to 2022. We will continue to review future maintenance budgets and to set targets in line with funding through the upcoming spending review.

The government's investment programme will also fund specific maintenance activities. As part of this work:

- annual allocations are made for infrequent maintenance activities and asset repairs. For 2021 to 2022, £200 million will be invested in these works which will support around 700 schemes across the country
- a supporting £240 million has been allocated across the 6-year programme to create an asset replacement allowance. This investment will target flood defence assets which are approaching the end of their operational life and need to be replaced to make sure communities are kept better protected from flooding, but for which Partnership Funding contributions cannot be secured. The investment will fund the minimum works required to extend the life of existing flood defences, whilst balancing investment, economic return and the risk of failure. It will ensure that the condition of around 150 flood defence assets per year is improved

Enabling the delivery of schemes and incident response

Delivering schemes and responding to incidents requires investment in a range of activities. The £5.2 billion programme will fund activities that allow schemes to be built – such as developing flood modelling evidence – and activity that supports incident response including developing flood warning systems and investing in the pumps that are needed to respond to flood events. It will also refine and improve our understanding and forecasting of risk to maximise the benefits from the investments made. Examples of projects that will be delivered through the investment programme are included in the next section on [Continuous Improvement](#).

Investment will also be made in the vital network of assets such as bridges and hydrometry gauges that are crucial to managing and reducing flood risk. Over 6 years, around £190 million to £230 million will cover cross regional and national costs including equipment and national initiatives (see Table 1) and approximately £600 million will be invested in activities that underpin the ability to deliver schemes, respond to incidents and reduce risk to people and communities.

Examples of enabling and support programmes are included in Figure 8.

Figure 8: examples of enabling and support programmes

- providing evidence through hydraulic modelling to underpin investment decisions on capital schemes
- providing warnings and information to communities and emergency services before, during and after flooding events
- providing hydrometric data to understand, forecast and manage flood risks
- developing tools and information to engage with our community and professional partners directly linked to improving flood preparedness
- protecting the environment from the impact of flood risk management activities including complying with legal requirements
- maintaining bridge structures which enable access to operatives to maintain and operate key flood defence assets

Continuous improvement

We will continue to seek ways to improve the way that the programme operates and to make sure we are targeting resources effectively.

Defra and the Environment Agency are assessing the benefits of the 2015 to 2021 investment programme, which will be published by the end of 2021.

We will continue to refine and improve our understanding and forecasting of risk. Two projects in this space that will be funded through the £5.2 billion investment include:

- the Environment Agency is beginning its development of the next Long Term Investment Scenario (LTIS), due to be published in 2025. This will help us understand what future flood and coastal erosion risk management could look like. Findings from this may inform our approach to investment in flood and coastal defences towards the end of the 2021 to 2027 investment programme and beyond
- the Environment Agency is developing a new National Flood Risk Assessment (NaFRA2) which will provide a wide range of more accurate data, covering risk from rivers, the sea and surface water. The new Assessment will be published in 2024 and will provide a refreshed evidence base to better inform our management of risk

We will also improve our approach to investment by exploring and implementing targeted refinements to the Partnership Funding rules to better reflect risks and benefits, balancing this against the desire for programme stability. There are two sets of changes envisaged that will affect the new programme:

- in April 2020, the government announced four technical amendments to the Partnership Funding rules (summarised in Figure 9). The amendments will be applied to the Partnership Funding rules from April 2021
- earlier this year, the government launched a call for evidence to explore whether any specific changes should be made to strengthen the assessment of local circumstances in the new investment programme. This had a specific focus on communities that have been frequently flooded in the past, communities that are more economically vulnerable, smaller communities, and communities in need of greater property-level measures to resist flood water. The call for evidence also explored how timely and wider financial contributions could be better secured to assist with the pace of developing a flood scheme, how progress of the overall programme can be tracked, and further ways we can increase the uptake of property flood resilience measures to enable householders and businesses to better prepare for flooding

The government will consider the responses and, later this year, will launch a public consultation to invite views on potential changes we wish to make to provide further

protection to frequently flooded communities. Any changes that arise from the call for evidence or upcoming consultation will be published and will be applied to and shape this current investment programme. Appropriate notice and guidance will be given to stakeholders to allow for the effective planning and delivery of schemes.

Figure 9: April 2020 technical amendments to the partnership funding rules

1. Updated payment rates to account for inflation and impacts of flooding including on mental health and wellbeing.
2. Increased payments for environmental benefits to capture more fully the wider environmental benefits delivered by flood and coastal defence projects and to help support nature-based solutions.
3. More funding for flood schemes which also better protect properties that will later become at risk of flooding due to climate change.
4. Amended flood risk bands for qualifying schemes to add a new intermediate risk band between high and medium risk. This will mean more schemes that reduce surface water flood risk are likely to receive government funding in the future.

We will seek further efficiencies in programme delivery. By 2027, the Environment Agency will deliver efficiency savings of 10% across the programme. This will be reinvested into the programme. Alongside this capital investment efficiency, we will work with the Environment Agency on their revenue investment for 2021 to 2022 as part of making the investment go as far as possible, prior to identifying an efficiency target for future years as part of the upcoming spending review.

The Environment Agency will continue to involve their supply chain early in project development, use more sustainable contracts with their partners and collaborate on opportunities. The use of longer-term contracts as set out in Environment Agency delivery frameworks will help ensure construction methods are more effective and efficient. This will help drive innovative and sustainable approaches and align with the direction set out in the government's Construction Playbook and National Infrastructure Strategy.

Measuring our success

Our primary objective to better protect 336,000 properties provides the headline indicator for the 2021 to 2027 investment programme. This builds on the successful implementation of the first 6-year programme better protecting 300,000 homes by March 2021 (see Annex A). Our investment in the new programme intends to deliver a wider range of additional benefits and outcomes.

To monitor delivery and impact of the new 2021 to 2027 programme, we have developed a suite of Key Performance Indicators (KPIs) that will track the programme's outcomes and benefits, expenditure, asset condition and maintenance, and programme delivery risks. The refreshed set of metrics includes, but is not limited to, the following measures:

- progress towards 336,000 properties better protected
- hectares of agricultural land better protected
- hectares of natural habitat created/improved
- value of capital expenditure
- total value of Partnership Funding secured
- progress of individual major projects within the programme
- updates on programme risks
- progress towards the target to reduce flood risk by 11%
- value of flood defence maintenance expenditure
- number of Environment Agency assets at target condition

We are also working to implement strengthened oversight and assurance of programme delivery. This work will be overseen by a Defra board with a remit covering both the capital programme and asset maintenance. The board will undertake quarterly monitoring and assurance of performance against the KPI suite as well as taking an independent view of programme risks, with the ability to commission external evidence as required to support assurance.

In addition to oversight and assurance of the overall programme, we undertake dedicated and robust assurance of the individual projects within it, as set out in both Defra's and the Environment Agency's Integrated Assurance and Approvals Strategies (IAAS). This approach ensures compliance with both the governments guidance on '[Managing Public Money](#)' and the Infrastructure Projects Authority's 'Guide for Effective Benefits Management in Major Projects'.

Business cases for the larger flood schemes (more than £10 million value) are assured and approved by a Large Project Review Group (LPRG, with representatives from Defra and Environment Agency), with the very largest (more than £100 million value) also subject to review and approval by Defra's Investment Committee and by HM Treasury.

We are implementing the changes set out above from April 2021. Further work is planned to build on this during 2021 and 2022, drawing on external expertise to inform Defra's independent approach. The metrics will ensure that Defra and the Environment Agency:

- can identify new or ongoing issues in delivering the programme in order to resolve them quickly without impacting on the progress of the programme
- have a clear, consistent record of the programme's progress, allowing for greater scrutiny and accountability – this will also enable Defra and Environment Agency to demonstrate that the programme remains strong value for money and that it is achieving its forecasted outcomes and benefits

Keeping updated

The programme of schemes that make up the 2021 to 2027 investment programme will be reviewed and refreshed as projects progress. This allows for flexibility within the 6-year period to manage change and introduce new schemes or urgent works if necessary. Annual updates on the programme will continue to be published on GOV.UK so local communities can monitor the progress of their schemes.

In addition, the Environment Agency produces an [annual summary of flood and coastal erosion risk management work carried out by RMAs in England](#). These reports detail the investment in, progress of and wider benefits of flood schemes, including infrastructure better protected and environmental benefits.

[Find out if you are at risk of flooding and sign up for flood warnings](#) on GOV.UK.

Annex A: the 2015 to 2021 flood and coastal defence investment programme: a look back

Delivering the first long-term programme

In autumn 2014, the government announced its first long-term commitment to invest in and develop a 6-year flood and coastal defence programme for England – the 2015 to 2021 programme. Through this programme, the government has invested £2.6 billion in flood and coastal defences.

This programme surpassed its target of better protecting 300,000 homes across England by March 2021 (Figure A1). It was delivered on time, to budget and against the backdrop of significant winter storm events and the COVID-19 pandemic. The programme has better protected a variety of different types and sizes of communities. For example, of all schemes in the programme, approximately 70%⁷ better protected fewer than 100 homes each, supporting smaller communities. In addition, 45,000 of the homes better protected were at significant risk of flooding and coastal erosion in the 20% most deprived communities.

The Environment Agency has led schemes that have better protected around 200,000 of these homes. The Environment Agency works with and supports other Risk Management Authorities (RMAs) who have led schemes that have better protected the remaining 100,000 homes.

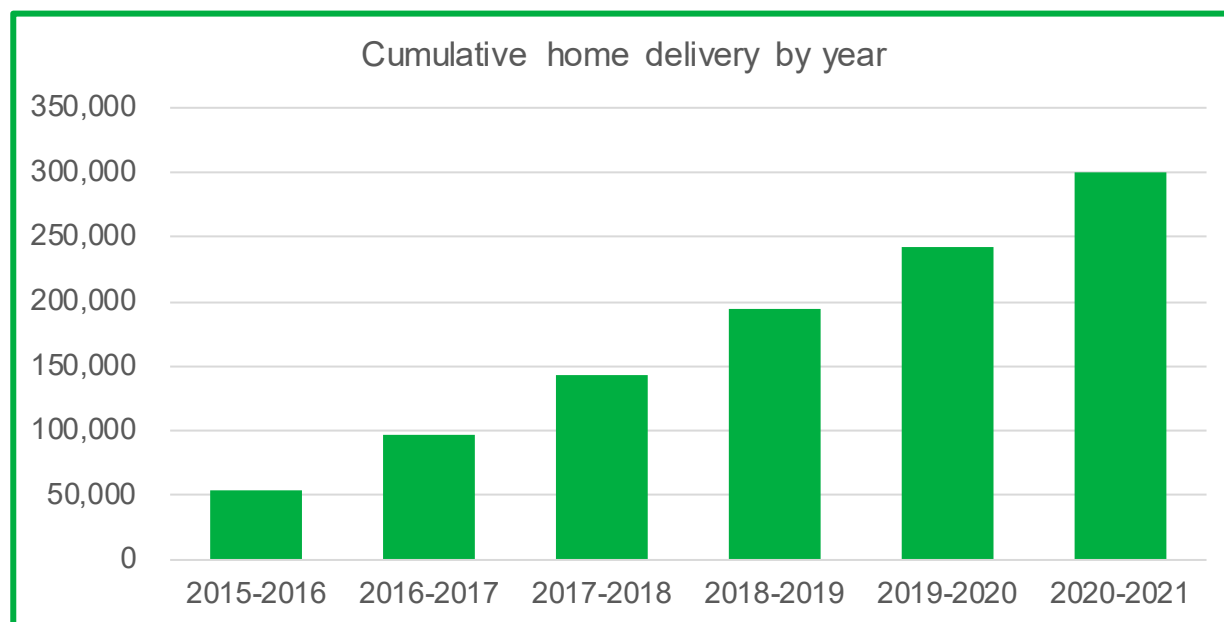
Whilst better protecting homes was the key driver for the 2015 to 2021 programme, a wide range of additional outcomes and benefits have also been achieved. The programme is expected to save the economy more than £28 billion in avoided damages over the life of the defences. The programme also aims to provide better protection to around 580,000 acres of agricultural land, 350 miles of railway and 5,000 miles of highways. In addition, it will deliver environmental benefits – it aims to improve or create 16,000 acres of water-dependent habitat, create 2,700 acres of intertidal habitat and improve 380 miles of river habitat.

⁷ 70% by number of schemes.

The Environment Agency produces [an annual summary of flood and coastal erosion risk management work carried out by all RMAs in England](#)⁸. These reports detail the investment in, progress of and wider benefits of flood schemes, including infrastructure better protected and environmental benefits.

Defra and the Environment Agency are assessing the benefits of the 2015 to 2021 programme and will publish a report by the end of 2021.

Figure A1: delivering the better protected homes target between 2015 and 2021



Investment in the 2015 to 2021 programme has benefitted all areas of England. Examples of schemes supported in each region are set out below.

East of England

Improvements to Stow Fen Pumping Station, Norfolk: improvements were completed by Downham & Stow Bardolph Internal Drainage Board in 2018 with over £1 million of government investment. The works better protect 170 homes, in addition to over 150 farm buildings and approximately 3,000 hectares of high-grade agricultural land at flood risk.

⁸ The annual summaries are prepared under Section 18 of the Flood and Water Management Act 2010 and the Environment Agency's National Flood and Coastal Erosion Risk Management Strategy for England.

East Midlands

Boston Barrier gate: installed in 2020, as part of a £100 million scheme, the Boston Barrier gate better protects over 13,000 homes and businesses in the town from the risk of tidal flooding.

London

The Salmons Brook Flood Alleviation Scheme: completed in 2016 with £15 million of government investment, the scheme better protects over 1,300 homes in Edmonton and Enfield.

North East

Morpeth Flood Alleviation Scheme: a £27 million joint Environment Agency and Northumberland County Council project completed in 2017. It was supported by £15 million of government investment to better protect 800 homes from the risk of flooding from the River Wansbeck.

North West

Rossall Coastal Defence Improvement Scheme: two kilometres of sea defences led by Wyre Council in partnership with the Environment Agency, supported by £57 million of government investment. It was completed in 2018 and better protects 7,500 homes.

South East

The Shoreham Adur Tidal Walls Scheme: completed in 2019, this scheme invested £37 million to significantly improve the standard of existing tidal defences in Shoreham-by-Sea. It better protects 2,300 homes and 170 commercial properties.

South West

Exeter Flood Defence Scheme: led by the Environment Agency, this scheme represents £32 million of improvements to flood defences and wetland habitats along the River Exe. Final stages of construction will be completed in July this year and it is already providing better protection to over 3,000 homes.

West Midlands

Burton upon Trent Flood Risk Management Scheme: a £30 million Environment Agency led project completed in February 2021 which improved around 3.7km of existing flood

defences through the town. Supported by government investment of over £21 million, it better protects over 4,000 homes and 1,000 businesses.

Yorkshire and the Humber

Mythrolmroyd Flood Alleviation Scheme: following significant flooding in the Calder Valley in 2015, this £41 million investment will better protect over 200 homes in 2021.

Through the government's Partnership Funding policy, over £500 million of contributions from private and public sources have been generated to complement government's £2.6 billion investment. Under this policy, there are four categories under which projects can attract grant in aid:

- wider economic benefits – these cover a broad range of eligible benefits including those to businesses and agriculture and avoided damages to public and private infrastructure
- benefits to households at risk of flooding
- benefits to households at risk of coastal erosion
- statutory environmental obligations

Table A1 summarises the distribution of grant in aid for each of these four categories for the 2015 to 2021 investment programme. Over £2.3 billion has been invested directly in flood and coastal erosion protection schemes. More than half of this funding has been allocated towards schemes reflecting their broad economic benefits (including better protecting businesses, agriculture, schools, hospitals, transport links and utility sites). Over a third of the funding has been allocated to schemes based on their benefits to households becoming less at risk to flooding and coastal erosion. The remaining £300 million of the £2.6 billion budget has been invested in activity that supports and enables the delivery of schemes – such as small-scale capital maintenance on assets to ensure they are in the required condition to offer protection and operate safely, and modelling evidence to understanding risk and the impacts of schemes.

In 2018 an evaluation of the Partnership Funding policy was undertaken. This highlighted that the policy had resulted in over 400 additional schemes going ahead, better protecting an additional 65,000 properties from flooding and 1,300 properties from coastal erosion⁹.

⁹ Risk and Policy Analysts in association with Royal Haskoning DHV (2018). *Further evaluation of Partnership Funding. Final Report*. Joint Flood and Coastal Erosion Risk Management Research and Development Programme.

Table A1: grant in aid awarded per category under the Partnership Funding policy

	Grant in aid (£ millions)	Proportion	Description
Wider economic benefits	1,270	55%	Economic benefits to businesses, agriculture, public services, health
Benefits to households at risk of flooding	850	37%	Benefits to households moved out of any flood probability category to a lower category
Benefits to households at risk of coastal erosion	140	6%	Benefits to households better protected from coastal erosion
Statutory environmental obligations	50	2%	Habitat created or improved to help meet statutory environmental obligations

Efficiencies delivered through the programme

The long-term nature of the 2015 to 2021 programme created conditions to unlock a step-change in project delivery efficiencies through certainty and transparency in the future pipeline of flood and coastal defence projects. As such the 2015 to 2021 Investment Plan set a commitment for the programme to deliver £268.7 million of efficiency savings on government investment during the 6-year period.

Figure A2 illustrates progress against the commitment for each year of the 2015 to 2021 programme. Up to December 2020, the programme had secured £262 million of efficiency savings. These savings have been reinvested back into the programme, allowing more schemes to progress and more communities to be better protected.

Examples of some of the efficiency measures that the Environment Agency has adopted, and which will be incorporated in the new investment programme, are:

- streamlining and standardising the approach to delivering key outputs such as risk management, assurance, data management and project delivery
- greater planning and work packaging which has enabled suppliers to reduce costs. For example, suppliers are given more advanced information on the pipeline of projects giving them time to plan resources and deliver efficiencies

- a culture of collaboration and continuous improvement has been adopted across delivery partners. Project efficiency registers are used to log opportunities and report savings made – to consistently identify and report new efficiencies

Figure A2: progress of the 2015 to 2021 programme against its cumulative efficiency target (as of December 2020)

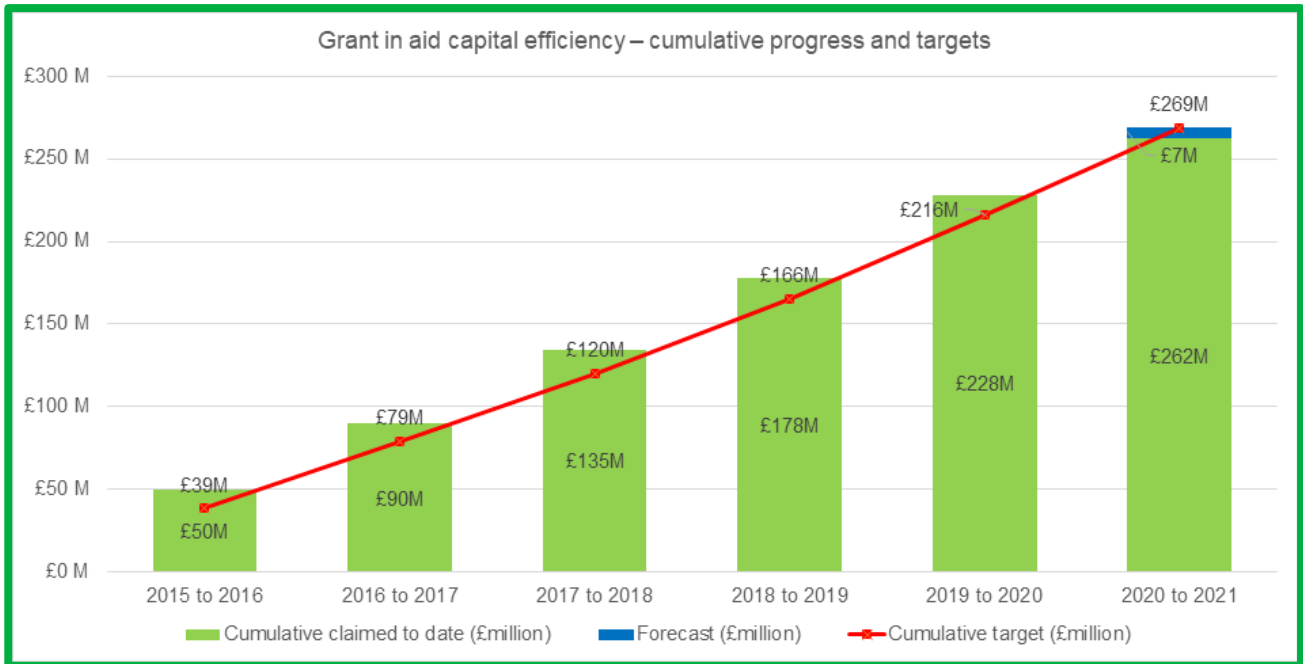


Figure A3: the Boston Barrier – delivering efficiency savings

The town of Boston suffered significant damage following the tidal surge in December 2013. A large and complex defence scheme was developed which included flood walls, embankments, gates and a barrier – requiring numerous licences and legal agreements.

Working closely with the Marine Management Organisation to ensure there were no detrimental impacts to fish migration, the window to dredge the river was extended by 2 months. This enabled the overall programme length to be reduced by 5 months, releasing savings of £2.5 million to the overall project budget. To date, this scheme alone has achieved a total of £12.1 million of efficiency savings.

