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for Environment
Food & Rural Affairs

Call for evidence on flooding and coastal erosion policy

Summary of responses

July 2020

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Contractor: Collingwood Environmental Planning Limited

Authors: Paula Orr, Spela Kolaric, Teresa Bennett (all Collingwood Environmental Planning), and Sally Priest (Middlesex Flood Hazard Research Centre)

Publishing organisation

Department for Environment, Food and Rural Affairs
Flood and Coastal Erosion Risk Management,
2 Marsham Street
London

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Contents

Introduction	1
Background	1
How the evidence is presented	2
Analysis of responses and key messages	4
The concept of resilience	4
A. What we understand by the term “resilience”	4
B. Describing outcomes, driving action and monitoring progress	11
Adapting to coastal change	19
C. Enabling action in coastal communities	19
Meeting the investment challenge	26
D. Corporation tax relief for business contribution	26
Local funding initiatives that harness community and private contributions	27
F. Developer contributions	33
Appendix 1: List of individuals and organisations that provided evidence	43
Appendix 2: List of abbreviations	46

Introduction

Background

As set out in the 25 Year Environment Plan, government's priority is to "reduce the risk of harm to people, the environment and the economy from natural hazards including flooding and coastal erosion".

To inform the development of future policy, Defra issued a Call for Evidence on flood and coastal erosion risk management on 8 July 2019. The call for evidence was open for six weeks (it closed on 19 August 2019) and was open to anyone with an interest in the topic. The call for evidence asked questions in relation to a selection of the flood and coast policy issues that the government would like additional evidence on. The call included 22 questions. The first four questions were about the respondent and the other 18 looked at the following topics:

- The concept of resilience (questions 5 to 8)
- Adapting to coastal change (questions 9 to 12)
- Meeting the investment challenge (questions 13 to 22)

A total of 72 responses were received (including 52 online submissions and 20 written responses which were sent to Defra's e-mail box). Table 1 displays the number of respondents by sector. A list of respondents is provided in Appendix 1. This does not include the names of three individuals/organisations that asked for their responses to be confidential.

Not all of the responses covered each of the 18 questions, so the number of respondents varies across the questions. This document provides analysis and the key messages for each of the 18 questions in the Call for Evidence (CfE).

Table 1: Call for Evidence respondents by sector

SECTOR	NUMBER
Public	25
Private	21
Academia	8
Non-governmental organisation	3
Citizen organisation	2
Membership or partnership organisation	3
Individual	9
Other	1

How the evidence is presented

For each question, the number of responses received is shown. The analysis involved creating a set of codes linked to the main aspects identified in the CfE document. A short list of common codes was created and used in coding all the questions, as far as relevant. Specific codes were also created for each question, covering sub-themes suggested in the CfE. Finally, some additional codes were created during the coding process, to reflect new themes coming out of the responses themselves.

Three categories of evidence were identified: academic evidence (i.e. peer reviewed publications), operational evidence (e.g. project reports, guidance, tools, case studies etc.) and anecdotal evidence (opinions, views and descriptions not supported by written evidence). Only responses relevant to the topic in question were analysed.

Additional evidence took the form of attached electronic files, hyperlinks to documents or websites or names of documents. This additional evidence was logged in a spreadsheet, including basic descriptive data covering:

- Contents relevant to the question
- Robustness (to what extent is the evidence based on sound methodology or sources?)

Once the coding of responses had been completed, key points were identified for each individual question, focusing on:

- Points mentioned most frequently
- Points for which strong evidence was presented.

Responses for all the questions varied considerably in length. For example, some of the responses to the metrics questions were only a couple of sentences with a link to a metric and others were over 1250 words. Care has been taken to try not to over represent the longer responses within this summary of findings.

Analysis of responses and key messages

The concept of resilience

A. What we understand by the term “resilience”

The analysis of responses for this section explored the understanding and application of the term “resilience”. The following key messages emerged:

- Almost two-fifths of respondents said they used the concept of resilience in their own work. These included national and local public bodies, water and wastewater utilities, insurance companies and non-governmental organisations, as well as academics.
- Many respondents associated the concept of resilience with having a range of measures for dealing with flooding. They felt that the table in Defra’s CfE (p5-6), which shows four concepts of resilience¹, was a good illustration of the range of approaches. However, other respondents felt that some of the types should not be included in a concept of resilience. Many respondents said that it was misleading to include resistance as a type of resilience. Some stakeholders involved with coastal erosion said that transformation should not be considered resilience in a coastal erosion context.
- Stakeholders need to make efforts to communicate effectively about flood resilience. It is important to avoid misunderstandings about the relationship between resilience and resistance, as these could lull at risk communities into a false sense of security.

5. How is the concept of resilience applied in relation to flooding and/or coastal erosion? For example, how do you use it in your own work? How is it used internationally?

This question had 68 completed relevant responses. 14 respondents provided links to evidence or uploaded documents.

The responses to this question reflected a wide range of understandings of resilience, with different responses focusing on community, engineered or financial resilience. While many respondents referred to the four elements of resilience described in the Introduction to the CfE (see summary box above), some commented that the only conceptualisation of resilience used in practice (for example in planning policy) is ‘bounce-back’, while for others, the distinction between resilience and flood risk management approaches was unclear.

¹ The four concepts of resilience shown in the CfE are: resilience as resistance, resilience as bounce-back, resilience as adaptation and resilience as transformation.

Many respondents associated the concept of resilience with having a range of measures for dealing with flooding. They saw the table in the CfE (p5-6), which shows four concepts of resilience, as illustrating the possible range. Several felt that the concepts presented in the table gave a good description of all that is encompassed by the term resilience. Others felt that some of the concepts should not be included in a definition of resilience:

- Resilience as resistance. There was a split between respondents who liked the breadth of the depiction of four types of resilience and others who disagreed with including resistance as a type of resilience. The main reason given for not including resistance as a type of resilience was to avoid misunderstandings and the 'false hope' that resilience could mean resistance (e.g. Greater Manchester Combined Authority, National Flood Forum).
- Resilience as recovery. Several responses suggested that a focus on recovery could not be considered resilient in a farming context (Richard Pinney of Knights plc; Country Land and Business Association). They indicated that it may take several years for a farming business to recover from flooding, for example if feed crops are lost and animals have to be sold. Recovery is expensive and farmers' homes and businesses are tied up in land which cannot be moved. The responses suggested that emotional stress should also be taken into account as an impact on resilience and that the resilience of farmland should be assessed differently from resilience of land in urban areas.
- Some stakeholders considered that the term 'transformation' should not be used in relation to relocation of residents, for example in the context of coastal erosion because of the loss experienced.

The Environment Agency stated that the move from a narrow conception of protection to a broader one of resilience is at the heart of its draft Flood and Coastal Erosion Risk Management (FCERM) Strategy. The protection provided by flood and coastal defences was seen as just one part of the toolkit for creating more climate resilient places.

There was a strong response from coastal stakeholders such as the Coastal Group Network for the Environment that the current conceptualisation of resilience has been developed in reference to flood risks and their management and does not cover solutions that could be applied to coastal flooding and erosion. For example:

- Resilience in relation to coastal erosion is different from flood resilience because coastal erosion leads to an irreversible physical change (Coastal Partnership East, Southern Coastal Group, East Riding of Yorkshire County Council).
- While there has been a change in awareness in coastal communities at risk of flood and erosion damage, with local residents and Parish Councils taking emergency planning more seriously, there is limited willingness to invest in personal infrastructure or to adapt properties to lessen the risk of damage caused by flooding (Deben Estuary Partnership).

Several responses from academia suggested that the proposed conceptualisation of resilience would not promote effective action in the context of coastal erosion. Citing the Stockholm Resilience Centre's definition of resilience as the capacity to deal with change and continue to develop, the British Geological Survey (BGS) expressed concern that the idea of continuing to develop was absent from the proposed approach. If this capacity is not explicitly included in the definition, the BGS feared that avoidable maladaptation could occur in coastal communities.

The Coastal Group Network for the Environment referred to issues that contributed to their concern that the situation of coastal places has been overlooked:

- Government is not promoting the National Coastal Erosion Risk Mapping which was intended to highlight the risk of coastal erosion to the nation but has not been made easily available to members of the public since its completion in 2016.
- The revised National Planning Policy Framework (NPPF) guidance no longer refers to the need to consider the outputs of the Shoreline Management Plans (SMP).

A range of stakeholders from different sectors (public, private, non-governmental) mentioned the importance of working with natural processes as an element of resilience.

Almost two-fifths of respondents said they used the concept of resilience in their own work:

- Many academics provided evidence from their own research, for example Dr Evangelos Ntontis of Canterbury Christ Church University referred to a review of definitions of resilience looking across 80 papers. This found that while many different descriptions were used, nine core terms appeared regularly in definitions of resilience: *'local knowledge, community networks and relationships, communication, health, governance and leadership, resources, economic investment, preparedness, and mental outlook'*. The Grantham Research Institute (based at the London School of Economics and Political Science) highlighted the Institute's work on the concept of the Triple Benefit of Resilience (Surminski and Tanner, 2016) which assesses the full range of benefits from resilience investments, including unlocking economic growth through removing the dampening effect of risk and stimulating business and entrepreneurial activity.
- Water company responses referred to the way that the concept of resilience has been formally embedded in the water sector through the statutory duty introduced by the Water Act 2014. This was a central theme for the 2019 Price Review led by Ofwat. For Ofwat, resilience is: *'the ability to cope with, and recover from, disruption and anticipate trends and variability in order to maintain services for people and protect the natural environment now and in the future'*. (Ofwat, 2017)
- Several local authorities described how they are implementing resilience approaches (Greater Manchester Combined Authority (GMCA), Salford City Council, Greater London Authority (GLA)). These tend to have an 'urban resilience' lens which puts weight on social, community and institutional capacities to survive

and grow, e.g.: *'the capacity of individuals, communities, institutions, businesses and systems within a city to survive adapt and grow no matter what kinds of chronic stresses and acute shocks they experience'* (GLA). Responses mentioned practical expressions of this urban focus including:

- Raising developers' awareness of the risk of flooding, including to homes outside the floodplain, so that they incorporate flood protection measures more widely (GLA).
- Considering the long-term effectiveness of resistance and resilience measures in the most vulnerable areas: factors such as deteriorating property conditions, tenure and transience and affordability affect the feasibility and reliability of Property Level Resilience measures (GMCA).
- Making businesses resilient to residual risk: GMCA noted that Small and Medium Enterprises (SMEs) find it difficult and have little appetite to make investments as they have poor lines of credit and limited access to loan facilities.

The Zurich Flood Resilience Alliance provided a definition of community flood resilience that connects development and risk management: *'the ability of a community to pursue its development and growth objectives, while managing its disaster risk over time in a mutually reinforcing way'*.

Many respondents did not give a single definition of resilience but described a range of resilience measures, including:

- preparedness measures to cope with flooding and coastal erosion as well as more radical / transformational change when needed (Devon County Council);
- future-proofing designs against a range of climate change scenarios (Mott MacDonald);
- emphasis on the role of businesses, third sector organisations and communities in resilience (GLA).

Problems with the concept of resilience and its implementation were raised in many responses. These included:

- **The operationalisation of 'resilience'**: this was described by Our Amble Ltd as a move to *'self-management'* which meant that in some places communities were having to cope by themselves. Ed Rollason of Teeside University said that research shows that communities and individuals are not in a position to adopt protective measures in the way expected of them because they do not have the information necessary to take effective decisions.

- **Limited community involvement:** several responses were concerned about this and emphasised the importance of involving communities through increased community understanding and providing options for consideration.
- **Costs of resilience approaches:** Government will need to find ways of providing access to funding to make resilience possible.
- **Addressing synergies and trade-offs** between different types of resilience measures (e.g. Sally Brown and Charlie Thompson of the University of Southampton).
- **Lack of emphasis on ‘betterment’** or improving resilience in response to increasing risks from climate change (e.g. Royal Society for the Protection of Birds (RSPB)).

A small number of respondents provided **evidence from international practice:**

- The Environment Agency described the approach to flood resilience in the Netherlands. The Dutch model assesses mortality risk, but also considers spatial planning policies and makes a cost-benefit analysis of economic benefits against losses from flooding.
- The National Farmers’ Union highlighted that in the Netherlands there are efforts being made to find ways to avoid farmland flooding: the response refers to the Ooijen-Wanssum ‘*Room for Rivers*’ project where agricultural land has literally been raised to protect it.
- Many respondents (private sector and academic) have been involved in or drew attention to international initiatives including: World Bank's Global Facility for Disaster Reduction and Recovery (GFDRR); United Nations Sendai Framework (which calls for enhanced resilience to natural disasters including for example greater investment in risk reduction, preparedness, recovery, rehabilitation and reconstruction); a project with Cranfield University working with partners in Canada, Australia and Portugal; the Rockefeller *100 Resilient Cities* initiative and framework; and Zurich Flood Resilience Alliance’s *Flood Resilience Measurement Tool for Communities*.

Communicating and engaging on flood resilience: many responses suggested that the concept of resilience was not clear and that the term was confusing and potentially misleading for communities at risk of flooding and coastal erosion.

National Flood Forum, referring to research by Phiala Mehring, said that there are multiple constructions of resilience. Within communities there are many different understandings of the term and this can act as a barrier to action. National Flood Forum said it often preferred not to use the term although it would be keen to have a workable concept of resilience which puts communities at the centre (see below).

East Riding of Yorkshire County Council noted that work is required to communicate the concept with the public to ensure the understanding is consistent and all aspects are covered.

6. How can the different aspects of resilience be brought together into one “overall resilience” concept?

This question had 52 completed and relevant responses. Three respondents provided links to evidence or uploaded documents.

Responses covered a wide range of positions, from those reporting experience of developing an overarching concept of resilience to others arguing that it would not be feasible or useful to try to develop this kind of concept.

Some responses suggested that **a practical approach should be taken to integrating the different aspects of resilience**. West Sussex County Council proposed that this could be done through Multi Agency Plans; Cornwall Catchment Partnership suggested a partnership approach would be needed, proposing that Local Resilience Partnership could be formed, linking up with other existing local partnerships. Historic England said that a focus on *‘people, places and structures’* would ensure support for recovery and adaptation, suggesting a combination of a place-based approach with the use of the four concepts of resilience.

Some evidence was provided of organisations that are already using an overall concept of resilience. Several of these come from the water industry:

- United Utilities noted that the UK water industry has adopted a standard definition of resilience derived through a series of collaborative workshops. Resilience can be considered as an aspect of risk analysis and management, typically covering those risks that have greater impact than day to day operational risks. This was considered to have provided a structured and coherent approach to resilience, covering a broad range of possible mitigation actions and bringing in a range of stakeholders, from communities to government agencies to service providers.
- South West Water reported that it had worked with other water and wastewater companies and the Environment Agency to develop resilience standards which are risk-based. Learning from this was that standards have to take account of the statutory duties and legislative requirements of the various risk management authorities. Risk-based standards will need to reflect both the probability and impact of the risk event and should be proportionate to the impact.

Natural England’s response proposed a comprehensive approach to resilience covering all the hazards across a region as well as the current and potential threats to assets, systems or communities. Natural England described its experience of facilitating this kind of process in Midlands Region through the Middle Tame Projects in Tamworth, Fazeley and Whitacre Heath.

Several responses suggested ways of operationalising an overall concept of resilience by bring together work on the different aspects of resilience²:

- Yorkshire Water Services believed it would be beneficial to bring together the different aspects as separate work streams.
- South Tyneside Council suggested that a tool with a scoring system could be used for assessing how resilient a community is. A low score would indicate the need to direct resources to that community.

Many responses listed measures that might form part of a resilience approach, for example: physical barriers, the use of flood resistant materials, Property Level Resilience and timely flood warnings that notify residents to move valuables and vehicles to higher ground. These responses suggested that the broader the range of strategies deployed to address a shock or pressure, the more resilient communities would be.

Disbenefits of an overall concept of resilience. Coastal stakeholders who were concerned that the concept of resilience as set out did not relate to coastal flooding and erosion (see above) also disagreed with the idea of an overarching concept of resilience.

Several responses suggested that the lack of a clear definition of flood resilience, supported by an understanding of systems and complexity, was an obstacle to developing an overall resilience concept (e.g. ICE blue, National Flood Forum, Ed Rollason). Sally Brown and Charlie Thompson (University of Southampton) saw inconsistent engagement and education as a major problem to developing a shared understanding of resilience.

Dr Evangelos Ntontis suggested that it would be more useful to specify domains of community resilience (e.g. communication issues, group relations and intergroup effects such as mutual trust, dissemination of information). Each agency could then work with specific objectives in relation to particular domains at the local level.

The Chartered Institution for Water and Environmental Management (CIWEM) suggested that it would not be possible to bring together the concept of resilience any more than was set out in the Call for Evidence. This response warned against shoehorning diverse issues into a single concept of resilience, in order to provide a simplistic solution. Similar concerns were expressed by the Alde and Ore Association.

The GLA indicated that while it was supportive of the concept of resilience standards proposed by the National Infrastructure Commission and set out in the Environment Agency's draft FCERM Strategy, setting resilience standards for flood risk in dense urban areas would be challenging, especially given the complexity of these areas and surface water issues.

² Five aspects of resilience were identified in the Call for Evidence: social, economic, infrastructure, institutional and community resilience.

Alternatives to integrating flood resilience in one overall concept of resilience.

Devon County Council suggested that rather than a policy of resilience that tried to cover complex situations, resilience should be seen as '*part of an overall continuum of response to flood risk*'. This response proposed that it would be better to use the term of '*being prepared for flooding*' which involves thinking about different people and places and what being prepared means for each of them.

CIWEM suggested that using resilience standards would provide a way of integrating different types of resilience in practice.

Another response suggested that resilience needs to be set in the context of an adaptive approach, with the focus on people and organisations creating a vision and exploring pathways to achieve it (National Flood Forum). This was seen as having advantages in terms of a forward-looking positive narrative and the capacity to encompass different definitions of resilience that are relevant to the needs of different stakeholders.

B. Describing outcomes, driving action and monitoring progress

The key messages in this section refer to the effective use of metrics and the advantages and disadvantages of using composite metrics to describe, drive and monitor flood and coastal erosion outcomes. A few responses disagreed with the use of metrics-based approach in principle.

- Responses reflected the broad scope of what was considered a metric, ranging from approaches to measure single outcomes to more complex suites of composite indicators.
- The evidence includes examples of metrics used in other contexts, however there appears to be limited transferability of these metrics to the flood and coastal change context.
- The main advantages of composite metrics highlighted by the responses include: a more comprehensive and systematic approach; extending the range of actors and the prospects of investment; enabling actions and interventions to be prioritised; enhancing awareness and communication; increasing transparency and the adoption of an agreed approach; enabling consistency of approach; reflecting the dynamism of flood risk; and, highlighting responsibilities and monitoring progress.
- The main disadvantages of using composite metrics were identified as: the possibility of limiting actions (if organisations start to perform to achieve the metrics rather than the outcomes); leading to a more short-term approach; oversimplification of complex issues and loss of local nuances; difficult questions remaining unresolved; information not being temporally or geographically uniform; the possibility of introducing unfairness and misrepresentation into prioritisation; requiring high administrative and resource effort; and, having large implementation challenges.
- The main aspects suggested to overcome these disadvantages include: clear communication and stakeholder engagement; availability of financial and human resources; partnership approach; ensuring data requirements; providing clear guidelines; and ensuring monitoring and reporting requirements.

7. Please provide examples from other contexts of the effective use of metrics to achieve an overarching outcome (e.g. sustainability or wellbeing) and of frameworks which are successful in supporting this.

This question had 49 completed responses and 31 links to evidence or documents were uploaded within the supplementary question. Some responses to Question 7 are more relevant to answering Question 8 and responses have been analysed and reported as part of the more relevant question in these cases.

Due to the broad scope of what is determined to be a metric, responses were extremely varied with some focussing on approaches to reach single targets or operational goals through to more complex suites of composite indicators.

A few responses suggested that the respondent did not agree with a metrics-based approach at all, citing that frameworks create inconsistency and are not able to be communicated well to the public.

The majority of responses supported the use of metrics for considering resilience and a number of examples of metrics were suggested. These examples of metrics provided showed some degree of diversity.

The purpose of the metrics described varied by context, but most were either being used to assess the resilience against some risk, the prioritisation of resources on a risk basis (including the assessment of benefits and costs) and/or for monitoring and measuring progress against a goal or of some intervention.

The scales of metrics also varied considerably both spatially and temporally. For example, those implemented metrics suggested varied spatially from smaller inventions within one company's business to other larger-scale examples of metrics being collected or used nationally or internationally. Temporal differences included examples of long-term longitudinal metrics or those which aim to have a longer-term outlook (e.g. Index of Multiple Deprivation etc.) with others being implemented over a shorter timeframes or at a specific point in time (e.g. Warwick-Edinburgh Mental Wellbeing Scale, National Trust Payments for outcomes etc.). Additionally, the units of analysis varied from individuals or within one company up to communities or city scale.

All the metrics mentioned can be considered to have an operational basis, rather than being purely academic or theoretically constructed. Case studies are available to illustrate the effectiveness of many of the metrics.

Specific metrics from other contexts included: World Bank *City Strength Diagnostic*, Historic England *Public Values Framework Heritage At Risk*, *Local Area Agreements*, *Farm Practices Survey* and the *Countryside Survey*, Committee on Climate Change *Climate adaptation indicators*, Defra *Sustainable Development Indicators in your pocket*, PHE *Public Health Indicators*, *Public Sector Agreement Targets for SSSIs*, *Public Sector reporting duties and guidance for adaptation capacity*, UK's *Broadband Universal Service Obligations*, Network Rail sustainability, weather resilience and climate change metrics,

Warwick-Edinburgh Mental Wellbeing scale, National Infrastructure Assessment, Wales' Wellbeing of Future Generations Act Indicators, Norway's Composite Community Resilience Metrics, Arup / Rockefeller City Resilience Index, Office of National Statistics Index of Multiple Deprivation, Office of National Statistics Measures of national wellbeing Dashboard, US Baseline Resilience Indicators for Communities, Australian Natural Disaster Resilience Index, Port of London Authority Climate Change Adaptation Matrix, National Trust Payments for Outcomes, Local Highways Maintenance incentive fund frameworks, WeAdapt Climate Capacity Diagnosis & Development (CADD) tool, Transport for London's Healthy Streets approach, London Environment Strategy 2018, London Climate Change Partnership's Indicators for climate adaptation for London and C40 Measuring Progress in Urban Climate Adaptation framework.

Only a few responses directly mentioned transferability of specific metrics to the flood and coastal change context (e.g. Arup *City Resilience Index*, WeAdapt *Climate Capacity Diagnosis & Development (CAAD)* tool). In general, when transferability was directly mentioned it related to the type of metric-based approach, rather than the specific content. Key transferability elements mentioned included the adoption of national indicators but allowing local flexibility and the adoption of outcome-based approaches. These would have defined technical standards to incentivise action, but organisations would be accountable to reach set targets.

Whilst the metrics discussed in the paragraph above came from other contexts, responses also suggested metrics and examples of their application already used in flood risk or water management. Many of these referred to the use of metrics for the prioritisation of actions in flood risk management plans. Specific tools/examples included: Devon and Hampshire County Councils' and other Lead Local Flood Authority *prioritisation criteria* used in flood risk management plans, *CIRIA best tool for the benefits of SUDs, sewer flooding targets* set by Ofwat for United Utilities and Northumbria Water capital accounting approach to benefits; Zurich Flood Resilience Alliance *Flood Resilience Measurement Framework* (application to Lowestoft), *New Anglia Local Enterprise Partnership strategy, Data and Analytics Facility for National Infrastructure*, Suffolk Internal Drainage Board-led *Benacre Flood Risk Management Project*, Suffolk, District-council led *Lowestoft Flood Risk Management Project*, North Norfolk, District Council-led *Bacton Sandscaping project* and *2012 coastal resilience scheme in Felixstowe*, Suffolk, *Flood Risk Analysis* approach of The Netherlands, National Infrastructure Commission's *flood resilience standards*, *Hull and Haltemprice Flood Risk Management Plan*, *Zurich Flood Resilience of Community frameworks*, UK Water Industry Research (UKWIR) *Asset Health Indicators*, Affinity Water resilience metrics for operation, corporate and financial resilience and water company drought resilience metrics, Anglian Water's *Strategic Direction Statements* and Public Interest Commitments, Wessex Water's High level outcomes, *Drainage and Wastewater Management Plans framework*, US *National Flood Insurance Program Community Rating System (FEMA)*, Defra *Community resilience pathfinders* and Environment Agency's *TE2100 framework*.

Some responses highlighted the important prerequisite of a clear and comprehensive understanding of the current risk situation as a baseline for measuring progress. It was

commented that these data were missing in some cases (e.g. understanding coastal dynamics). Additionally, it was considered important that before a metric can be developed there needs to be an understanding of the inter-relationships and trade-offs between communities.

Several responses referred to barriers to the use of metrics, including the difficulty of developing a metric when there is high degree of spatial and temporal variability of risks, lack of information/data about the risk and details of the potential misalignment of indicators and targets of resilience.

8. What would be the advantages and disadvantages of using composite metrics to describe, drive and monitor flood and coastal erosion outcomes (nationally and locally)?

a. If you identified disadvantages in question 8, how may these be overcome?

This question had 49 completed responses and 25 responses to the supplementary question. Five additional links to evidence were provided in the associated supplementary question.

Some responses highlighted **some confusion about what was meant by a composite metric** therefore it was not entirely clear if all respondents understood it to mean the same thing.

The majority of responses have been categorised as being anecdotal. Despite this, it is clear that in most cases anecdotal evidence would have been informed by operational experience. Three responses also made reference to academic literature, the majority of which provided evidence on the advantages and disadvantages of using composite metrics in specific contexts. One response referred to the EU's Joint Research Centre (JRC) *Competence Centre on COmposite INDicators and Scoreboards (COIN)*³. This initiative has provided in-depth evaluation and audit of over 60 existing composite indicators as well as providing guidance and best practice on the construction and monitoring of composite indicators.

Advantages⁴ of composite metrics: the majority of responses to this question identified a range of advantages of the use of composite metrics, including:

- **Offers a more comprehensive and systematic approach:** greater relevance and richness than single metrics, permitting a more holistic view and the realisation of multiple benefits and desired outcomes. Many responses noted that flood risk is complex and needs to include many different sectors. Additionally, several responses commented that a composite metric permits the inclusion of a wide range of benefits which might be difficult to include otherwise.

³ <https://ec.europa.eu/jrc/en/coin>. The JRC-COIN have undertaken 60 statistical audits of composite metrics of many different types and policy contexts.

⁴ Note: Many responses included caveats that the advantages would be gained only with a well-designed metric.

- **Broadening actors and widening the prospects of investment:** consideration of different aspects of risk and different benefits would broaden the range of stakeholders engaged and beneficiaries identified as well as the opportunities to secure investment. Some suggested that composite metrics may also secure earlier engagement.
- **Enables actions and interventions to be prioritised:** enabling all relevant elements to be included into prioritisation and opportunities.
- **Composite metrics can enhance awareness and communication:** can be used as a tool to communicate to communities. Greater consistency in metrics can also better enable the communication of the needs of asset owners and overcome current misalignments.
- **Provides greater degree of transparency and the adoption of an agreed approach:** developing and agreeing a shared ambition and providing a common drive for flood risk management. Once agreed upon by all stakeholders the metrics should permit a direction of travel to meet desired outcomes.
- **Consistency of approach:** enabling more national consistency and overcoming some of the current variation in flood risk management and the disparity in outcomes.
- **Reflects dynamism of flood risk:** enabling the changing nature of risk to be considered.
- **Highlight responsibilities and monitor progress:** facilitating the identification of the roles and responsibilities of different organisations and measurement of the progress of those organisations. The metrics can be used to set the level of ambition, enable benchmarking and monitoring of progress towards targets/goals/outcomes, particularly when many different tools are being used in combination. It enables the comparison of progress across sectors.
- **Ease of use:** composite metrics are considered easier to use and interpret than lots of separate indicators.

Disadvantages of composite metrics

- **Complexity of both the issue and composite metrics:** construction of composite metrics requires judgement as there is no one single answer. This raises issues related to the difficulty of their construction and also the question of how they can be effectively communicated to lay people.
- **Use of metrics may limit actions** by narrowing the range of actions to those which result in the designated metrics and not the full potential spectrum of actions. Organisations may start performing to the metrics rather than outcomes.

- **Risk of leading to a more short-term approach:** unless carefully designed, metrics may lead to short-termism as they have in other areas (e.g. school performance tables etc.)
- **Over-simplification and concealment of complex issues** and loss of local nuances: some responses noted that composite metrics may be presented as a black box with a lack of transparency about the metrics' development, implementation and assumptions. If the metrics are unclear and not transparent then this may cause suspicions that organisations are masking performance.
- **Consistency versus a tailored approach:** difficulties in creating a uniform and consistent metric due to the different types and nature of the risks. One response, from Sally Brown and Charlie Thompson at the University of Southampton, argued that effective composite metrics therefore cannot be temporally or geographically uniform.
- **Difficult questions unresolved:** composite metrics do not resolve all difficult decisions. It is still necessary to make decisions about what risks are tolerable to society and how to balance these with other risks.
- **Introduction of inequalities and misrepresentation:** many responses highlighted the concerns that composite metrics will reinforce inequalities and lead to unfairness in prioritisation (e.g. urban areas over rural, domestic properties over mixed approaches). Additionally, it was recognised that some aspects are easier to measure than others (e.g. intangible elements are harder to integrate into a metric) and this may lead to misrepresentation.
- **High administrative and resource effort:** the cost of measuring and monitoring with composite metrics may be high in resources (time), taking money away from actions which influence outcomes. Some responses reflected on who might bear the burden of these costs and how they might be assisted. This may be through the collation of data or also the creation of partnerships, which some see as a prerequisite to the use of composite metrics (e.g. Cornwall Catchment Partnership).
- **Composite metrics were considered to have large implementation challenges:** a range of implementation challenges were expressed including:
 - Too complex metrics would create problems of too much data and cause difficulty in implementing the metrics;
 - Designing and implementing composite metrics would require the coordination of roles and responsibilities;
 - Compound metrics were considered to be much more difficult to implement and harder to use to deliver value for money;

- Different organisations and disciplines would have to work closer together and overcome competing agendas;
- Delivery would require skills and resources to be available as well as the time needed to produce and monitor;
- Access to data – particularly when from multiple organisations - and whether sufficient up-to-date detailed data are available.

8a. If you identified disadvantages in question 8, how may these be overcome?

Not all of the responses which highlighted disadvantages also suggested how they might be overcome. Therefore, not all disadvantages proposed within the responses were directly addressed with possible solutions. The analysis presented below categorises the actions needed to overcome potential disadvantages, rather than linking them.

Aspects needed for disadvantages to be overcome

- **Clear communication and stakeholder engagement:** metrics need to be transparent and require careful communication with stakeholders to enable understanding and prevent confusion and suspicion. Specific tools and strategies of communication may need to be implemented to achieve this. The Cornwall Catchment Partnership noted that engaging with communities is going to become more important and designing metrics which facilitate this is essential to including communities in the final decisions.
- **Financial and human resources:** funding is needed for both research and data collection, as well as for organisations to utilise composite metrics. Skills gaps also need to be addressed.
- **Partnership approach:** use of composite metrics requires partnerships to be formed as metrics and data will be drawn from a range of different organisations. There is a need to overcome technical and departmental silos. The responses discussed different types of partnerships (e.g. operational, academic etc.).
- **Data requirements:** ensuring that datasets are compatible with the metrics and consistent may mean that new and better data will be required to implement the metrics. Some responses highlighted the importance of confidence in evidence-based data and the need for expert advice. The use of remote/ automated data collection may reduce some resource costs of data collection.
- **Clear guidelines:** needed to assure the transparency of the metrics and reduce the likelihood of misinterpretation.
- **Monitoring and the reporting requirements:** implementation of the metrics should be monitored and updated if needed. Any reporting of metrics needs to be auditable.

Many stakeholders suggested that some of the disadvantages can be overcome via the **good design of the composite metrics**:

- Well-designed metrics that are fully SMART (specific, measurable, achievable, realistic time-based) with stretching but realistic/achievable targets which are delivery focussed;
- Metrics that are efficient to implement to ensure that they do not require too many resources;
- Metrics designed to deliver broader outcomes for society and maintain a wide view of benefits (and costs) and include social, economic, environmental and cultural factors);
- Metrics that take account of relative benefits of interventions and prioritise those with wider and stronger benefits, rather than easiest solutions;
- Metrics that are appropriate to their audience, including local communities, in order to increase their use, transparency and effectiveness in enabling conversations and disseminating actions;
- Metrics focused on delivering identified outcomes, rather than prescriptive outputs, allowing flexibility in actions;
- Sub-metrics that are clearly related and limited in number to reduce complexity - but without oversimplifying and losing local nuances;
- Metric-based targets that are harmonised so that where multiple metrics are used it is clear which ones take precedence.

Other responses commented that a metric-based approach would need to have a well-defined baseline and utilise up-to-date information; be subject to periodic review and not too onerous to implement. A metric-based approach could start with high level (national) metrics which could then be tailored more locally (e.g. risk type, location type, level of risk etc.). Some responses commented that for metrics to be effectively integrated their implementation would need to be compulsory.

Adapting to coastal change

C. Enabling action in coastal communities

The majority of the responses across all questions were from public sector institutions. The following key messages emerge:

- When asked to indicate approaches which coastal protection authorities and coastal groups can use to make a robust assessment of the long-term affordability and ongoing sustainability of coastal management policies, respondents cited the use of SMPs, partnership working and/or community engagement and the application of a multi-disciplinary approach to achieve multiple benefits.
- Respondents provided several examples of collective actions by several coastal authorities to manage the coastline. The most common activities included partnership working, community engagement, multi-disciplinary approaches, joint planning, coastal teams and cross-departmental working.
- A limited number of examples were provided by respondents where public authorities have successfully sought to use their Coast Protection Act 1949 powers to make a coast protection scheme carry out coast protection works.
- Respondents provided multiple examples of cases where a Coast Protection Authority has sought to create a Coastal Change Management Area (CCMA) within Local Plans. Other approaches to the creation of CCMA's and reasons for CCMA's not helping local communities to adapt to coastal change were also addressed.

9. Please provide evidence about approaches which coastal protection authorities and coastal groups can use to make a robust assessment of the long-term affordability and ongoing sustainability of coastal management policies, including any barriers to implementation.

There were 38 relevant responses to this question. Few responses referred to approaches which can make a robust assessment of affordability and sustainability of coastal management policies, but most provided information on approaches to coastal management or made suggestions for improved implementation of policies.

Affordability and sustainability of coastal management policies were included in many responses. Coastal Partnership East pointed out that affordability and sustainability were relative to the audience and the source of funding and could only be determined once options had been costed and available funding identified. The British Hydropower Association suggested that affordability and sustainability needed to be assessed on a '*multi-functional, multi-disciplinary, cross-border platform*'.

The need for long-term assessment of affordability was mentioned by Coastal Partnership East, the University of Bath and East Riding of Yorkshire Council. An approach to assessing the affordability of coastal management options in a situation of

considerable uncertainty about future impacts has been illustrated in the case of the train line at Dawlish through the use of *Real Option Analysis*⁵. Alistair Hunt of the University of Bath suggested that the approach had a general applicability especially with the need to integrate impacts of climate change into coastal management policies.

SMPs were cited by many respondents as being a good approach and starting point for assessing the sustainability of coastal management policies. SMPs were considered to provide a scientific evidence base on coastal change and to be an essential planning tool for coastal management. However, limitations to their implementation were raised, in particular the issue of affordability.

Partnership working and/or community engagement was mentioned as a key approach in many of the responses to this question. Specifically, partnership working was seen as enabling joined-up thinking, sharing of cross-agency data, pooling of resources and expertise and joint working on cross-boundary management works. Early engagement and bringing relevant parties together for improved delivery was highlighted. Community engagement was considered vital to raise awareness and understanding of issues and to seek long-term solutions. The following examples were given of partnership working:

- *The Bacton to Walcott Sandscaping Scheme*⁶ (Norfolk) involving approximately 1.8 million cubic metres of sand placed and engineered on the beaches providing robust protection to Bacton Gas Terminal for approximately 20 years, while extending the life of the village defences.
- The *Wrangle Sea Bank Project*⁷ (The Wash, Lincolnshire) providing increased protection to 3,500 ha of prime agricultural land and 460 properties.
- The Swanage Coastal Change Forum noted that it is in a position to bring relevant parties together in tackling coastal change issues.
- Coastal Partnership East said that it invests significant time into building a multi-disciplinary team that can work across agencies to share data and technology.

Linked to partnership working, **a multi-disciplinary approach** with the aim of achieving multiple benefits, was either mentioned explicitly or implied in several responses to this question. However, the responses indicated that using this kind of approach was more of an aspiration than a reality and was something to be improved upon.

The need for SMPs and FCERM projects to be recognised in Local Plans was specifically mentioned by Coastal Partnership East, the Environment Agency and the

⁵ Dawson, D.A., Hunt, A., Shaw, J and Roland Gehrels, W. (2018) The Economic Value of Climate Information in Adaptation Decisions: Learning in the Sea-level Rise and Coastal Infrastructure Context. In *Ecological Economics* 150 (2018) 1–10.

⁶ <https://www.north-norfolk.gov.uk/tasks/coastal-management/bacton-to-walcott-coastal-management/>

⁷ <https://www.w4idb.co.uk/2019/05/wrangle-sea-bank-project-summary/>

National Trust. These responses indicated that coastal management delivery was more effective where local plans and coastal management policies were aligned.

Barriers to implementation included: investment and funding mechanisms; lack of data; lack of multi-benefit approaches and joined-up solutions; insufficient community engagement; policies not fit-for-purpose; and limited availability of effective adaptation tools.

Issues around funding were raised in many responses, particularly in relation to the uncertainty of funds and the need for long-term budgeting, as well as the cost benefit assessment used to determine the funding of schemes. Some respondents proposed that flexible financing and innovative approaches to funding coastal management works could be used to get around difficulties. One example of an innovative approach was a scheme fully funded by Borne Leisure in Hopton (East Anglia) to protect a holiday park. This involved establishing a Community Interest Company to raise funds for the beach management scheme, principally through an annual levy on each of the caravan pitches within the coastal flood cell.

Useful information for coastal management policies was proposed in several responses. This included references to the *National Network of Regional Coastal Monitoring Programmes of England*; *National Coastal Erosion Risk Maps*; long-term investment scenarios; the Flood Research Programme; and the Flood Resilience Management for Communities (FRMC) 5C-4R framework for assessing community resilience. In addition, responses referred to the need to take account of the value of marine heritage⁸, natural and social capital, and the value of the economy arising from coastal management works.

Various other points were raised for consideration in taking forward coastal management policies. These included: the need for adaptation planning and building resilience to climate change, perhaps with a place-based approach; and the need to take account of impacts caused by coastal erosion on infrastructure, groundwater, farmland and communities.

Our Amble Ltd reported that it found the current method of determining the extent of erosion over a time period of 50-100 years to be inaccurate due to rapid climate change and the increase in frequency and force of severe storm events. Our Amble Ltd has developed an alternative method that involves analysing and dating refuse and litter eroding from dunes and comparing the coastline against old maps; this has led them to conclude that local erosion is occurring twice as fast as predicted.

10. Please provide information about how coast authorities have successfully combined decisions about managing the coastline (Shoreline Management Plans) with wider plans and decisions for the area (including land use,

⁸ <https://historicengland.org.uk/research/methods/characterisation-2/historic-seascapes/> and <https://research.historicengland.org.uk/Report.aspx?i=16332&ru=%2fResults.aspx%3fn%3d10%26ry%3d2019%26p%3d3>

economic development, social and environmental objectives) and the challenges of achieving this.

There were 30 relevant responses to this question. Most were from public sector organisations.

Partnership working and community engagement were mentioned in the majority of the responses. Several case studies demonstrated how partners have come together to deliver coast protection projects. For example: multiple partners contributing to coast protection works at Clacton-on-Sea; the St Austell Resilient Regeneration initiative implementing a series of projects within a vision for a wide area; a community delivery partnership for the Medmerry managed realignment scheme (North Solent); and coastal defence projects by Scarborough Borough Council, which have a number of goals, primarily linked to securing local economic wellbeing and generating future tourism income. In addition, examples of partnerships that were working well included: partnerships between Local Planning Authorities in Norfolk and Suffolk and also in the Poole area; the East Solent Coastal Partnership; and the Suffolk Coast Forum.

Linked to partnership working, multi-disciplinary approaches were covered in the majority of responses. Examples included: works at Clacton-on-Sea to protect critical infrastructure and homes, where, as part of a regeneration project there has been increased business investment, new jobs and multiple social benefits, as well as a measurable improvement in health outcomes for local people⁹; adaptive management in the face of increased coastal erosion and flood risk at Titchwell Marsh (North Norfolk) through a managed realignment scheme providing natural environment and local community benefits; and an integrated suite of projects developed for Lyme Regis (West Dorset) where South West Water, highways and coast protection funding was pooled to secure the most sustainable outcome.

Various responses highlighted the importance of local plans embedding SMP policies. Examples were also provided where SMPs have incorporated wider benefits to develop an alternative more sustainable plan (e.g. the Gorleston to Lowestoft shoreline strategy).

A few responses identified the value of joint planning and coastal teams and cross-departmental working. East Riding of Yorkshire Council reported that the coastal policy function sat within the local authority sustainable development team. This approach was reported to be working well.

A variety of challenges were raised, including:

- Lack of understanding of how marine processes and accelerating sea level rise might be affected by climate change;
- Aligning timing for action across partners and funding streams;

⁹ <https://www.eadt.co.uk/news/completed-36million-sea-defence-project-in-clacton-could-be-catalyst-for-town-s-regeneration-1-4287207>

- Securing funding to maximise additional economic benefits from schemes;
- The need for planners to know more about the environmental and social impacts of coastal flooding;
- The need to create mechanisms to plan proactively in advance of storms, and to have mechanisms in place to help use storm events as catalysts in planning for adaptation;
- Difficulties with the implementation of SMPs;
- The need to maintain active and on-going engagement with communities at risk;
- Challenges associated with the discovery during managed realignment works of high-quality archaeological features requiring recording and curation.

A few responses referred to information that could be used to inform decision making, including Pilot Project schemes looking at coastal adaptation in the Anglia Eastern area and the Natural Environment Research Council (NERC) funded *Coastal Resilience project*.

11. Please provide examples where an authority has sought, successfully or unsuccessfully, to use its Coast Protection Act 1949 powers to a) make a coast protection scheme to carry out coast protection works and b) levy coast protection charges in respect of such a scheme.

There were nine relevant responses to the question, the majority of which were from public sector organisations.

Examples where an authority successfully used its Coast Protection Act 1949 powers to make a coast protection scheme carry out coast protection works included: coastal defence realignment at Littlehaven Promenade (South Tyneside); Bournemouth beach management (Dorset); sea wall and groyne improvement works at Withernsea (Yorkshire); and Bacton sand engineering scheme (Norfolk). Although aware of the powers, East Suffolk Council was not aware of ever preparing a coast protection scheme as defined in the Act. Southern Coastal Group said that within the last five or so years, the majority of coast protection schemes have been approved under the Flood and Water Management Act 2010, with the Coast Protection Act being reserved for use with emergency and urgent works.

No examples were given where an authority sought to use its Coast Protection Act 1949 powers to levy charges. However, Coastal Partnership East reported a low level of awareness of this aspect of the legislation partly as it was viewed as '*antiquated*' and also that it was considered challenging to implement. While it was recognised that it is a potentially useful mechanism, the application of coastal charges was considered '*heavy-handed*' and not in line with the collaborative approaches adopted. The respondent said that other funding mechanisms (such as Internal Drainage Board (IDB) levies and Parish Councils) had proven to be better ways of collecting small but important contributions from

multiple landowners. JBA Consulting referred to the creation of a Community Interest Company and raising local finance to support coastal management works.

A few responses included suggestions of ways to help authorities use their powers under the legislation. These were: provision of clear guidelines and advice; updating the Act to take account of the relationship between erosion and flooding and the risks associated with climate change, as well as the need to include adaptation in relation to land; and enabling levies to be applied to a wide geographical area to account for all beneficiaries of the works, including tourists.

12. Please provide examples of cases where a coast protection authority has sought to create a Coastal Change Management Area including any barriers the authority faced, and how the area is helping local communities to adapt.

There were 15 responses to the question, the majority of which were from public sector organisations.

The majority of responses provided examples of cases where a coast protection authority had sought to create a CCMA. Examples where policies have been included within Local Plans for the identification of, and development control within, CCMA include the Purbeck Local Plan, East Suffolk Local Plan and East Riding Local Plan Strategy Document.

In Cornwall, areas of coastal change identified in the SMP have not been identified as CCMA in the Local Plan but are to be identified instead through the Neighbourhood Planning process. The National Trust expressed concern about this approach because of the loss of strategic benefits that could have been derived through inclusion in the Local Plan.

Coastal Partnership East said that several CCMA had been put in place along the Norfolk and Suffolk coast. Within East Anglia some Local Authorities have adopted 'rollback' policies within CCMA. In support of the policies, Local Authorities are offering free pre-application planning advice on suitable (and unsuitable) sites for rollback. Experience in Norfolk and Suffolk has shown that CCMA are a tool for Coastal Planning Authorities (CPAs) to prioritise which organisations and individuals to communicate with on coastal adaptation, the challenge being to know when and how to engage. One issue identified with CCMA is that they are not actively monitored. Coastal Partnership East is now investigating ways of updating them with the latest data (e.g. rates and progression of erosion).

Coastal Partnership East proposed flexibility and innovative approaches to development and land use within CCMA to enable opportunities for economic prosperity while adapting to change. Examples where this approach was being taken included: farm diversification into alternative land uses, such as tourism; and construction of removable buildings that can be relocated at a future date. Rather than only considering a rollback option at a time of fairly immediate risk, the suggestion was made to encourage early adaptation to maximise economic and societal benefits.

Several respondents felt that CCMA's were not helping local communities to adapt because:

- 'Hold the line' areas were excluded from some (unspecified) CCMA's, which risked new development being permitted in areas where it may be uneconomical or physically unachievable to 'hold the line'. The Environment Agency suggested that there should be a more precautionary approach to spatial planning for coastal change, making developers in coastal areas better aware of the potential risks.
- One CCMA had made no difference and did not prevent the granting of planning permission on the coast within the 50m limit of the 100 years erosion line, as noted by Our Amble.
- There were still locations where CCMA's had not been adopted to address existing coastal management challenges. Natural England observed that where local authorities had created CCMA's they had not always gone on to actively implement an adaptive response.

The National Trust suggested that accessible data on coastal erosion vulnerability should be made available in the same way that flood data is currently available as this would help affected communities.

Meeting the investment challenge

D. Corporation tax relief for business contribution

This section sought to identify the role of corporation tax relief in contributing funding to FCERM schemes. The main messages are:

- Responses indicated very limited experience of using corporation tax relief following contributions to government-funded flood and coast projects, although most respondents were aware of this mechanism.
- Eligibility requirements and other limitations and barriers to accessing corporation tax relief (e.g. complexity of the tax situation for larger organisations, lack of understanding of the process and clear guidance about eligibility etc.) were given as reasons for not using this mechanism.

13. Please provide evidence on how and where businesses have used the provision for them to receive corporation tax relief on their contributions to government funded flood and coast projects.

There were 20 relevant responses to this question. Responses were provided by public and private organisations and a few individuals.

Only Anglian Water positively confirmed the use of corporate tax relief when their organisation contributed funding to FCERM schemes. Other responses indicated awareness of the mechanism but had either not had any experience of using it or had attempted to use it unsuccessfully.

Many responses suggested that the approach had **potential to unlock and incentivise private contributions to schemes**, however there were limitations to this potential as well as barriers to being able to access corporation tax relief.

A limitation to the potential of corporation tax relief was both the type and the size of the companies (e.g. SMEs). For example, some farmers noted that many rural farming businesses are ineligible. Consequently, some responses called for the broadening of the scope.

Eligibility requirements were considered to be both a limiting factor and a barrier. The need for the scheme to have received Flood Defence Grant in Aid (FDGiA) funding was mentioned by Coastal Partnership East as a barrier. This means that where schemes are fully privately funded, tax relief would not be available. As a result, it was felt that the mechanism favoured larger schemes and had limited applicability for community-led flood schemes, fully privately funded schemes, schemes for surface water or on ordinary watercourses. Coastal Partnership East suggested that the scope of eligibility for tax relief could be broadened to include schemes where local levy funding is accessed.

A number of other key barriers to access were mentioned including: lack of awareness of the tax relief mechanism, complexity of tax situation for larger organisations, lack of understanding of the process and the need for clear guidance about eligibility and outside influences which may influence eligibility (e.g. Ofwat).

The Pocklington Flood Alleviation Scheme provided an example of these barriers. Despite the East Riding of Yorkshire Council informing the developer about the rules and that the authority would be prepared to support an application, the developer remained uncertain that the company would be eligible to receive tax relief on their contributions and it was not taken into account in the viability process.

A few responses requested clearer and more definitive guidance to be produced to reassure organisations about the tax relief rules.

Local funding initiatives that harness community and private contributions

The questions in this section aimed to identify examples of local funding initiatives that harness community and private contributions as well as factors and approaches to ensure their successful implementation. The key messages are:

- Respondents provided 55 examples of different initiatives delivering flood and coastal erosion outcomes from private or public-private partnerships mainly relating to surface, fluvial and coastal water management.
- The two main factors cited as determining the success of flood and coastal erosion initiatives which have private and community contributions were: meaningful and timely community engagement and contributors having a stake in the outcomes of the initiatives.
- The most common approaches mentioned by respondents that could encourage private and community funded initiatives were associated with enhancing knowledge of local communities at risk of flooding. Other frequently mentioned approaches included the provision of core/seed funding, provision of different financial tools and mechanisms, call for policy action and the establishment of long-term meaningful community engagement.

14. Please provide examples of initiatives delivering flood and coastal erosion outcomes which have been funded from sources other than the public sector, and explain how they were funded.

This question had 49 completed responses. Of these, about half of the responses were from the public sector, a quarter from private sector and the rest from other respondents (NGOs, individuals, academia/research institutions, citizen organisations and mixed partnership/membership organisations).

The majority of the responses provided examples **of projects/initiatives delivering flood and coastal erosion outcomes which have been funded from sources other than the public sector**. A few examples were mentioned by several respondents (e.g. Bacton in North Norfolk, London Strategic SuDS pilot, Wyre Catchment in Lancashire, Alde & Ore Estuary in Suffolk). The majority of the examples were based on anecdotal evidence. Some provided operational evidence (e.g. web-links to projects^{10,11,12,13} and strategies¹⁴).

The examples provided mainly relate to surface, fluvial and coastal water management (e.g. the *Bourne Valley Pathfinder Project* in north Hampshire to improve the management of surface water flows generated by groundwater emergence); housing associations and water companies working with local authorities to mitigate local surface water flood risk through sustainable drainage systems (SuDS); flood risk schemes partially funded by local residents; private coastal resilience scheme in Hopton, Norfolk; flood risk management scheme to mitigate surface water flood risk in Lincoln, Lincolnshire funded by the local council in partnership with the Environment Agency, local businesses, IDB and a water company.

The type of activities covered by the examples mentioned included:

- Local projects involving **nature protection**, e.g. *Wallasea Wild Coast*, a 670ha habitat restoration scheme in Essex and an RSPB-led scheme to create a nature-rich washland in Warton Mires, Lancashire to help alleviate the flooding of Warton, caused by water backing up at times of high rainfall from an outfall into Morecambe Bay;
- **Enhancement of cultural heritage**, e.g. Historic England *Heritage Action Zone* work in Appleby focused on supporting flood recovery and resilience¹⁵;
- **Infrastructure projects** to improve and promote flood resilience in local communities, e.g. a scheme to protect critical national infrastructure at Bacton in North Norfolk, and the nearby villages of Bacton and Walcott¹⁶; Southern Water plans to invest in three schemes to reinforce seawalls at pumping stations;
- **Coast protection projects**, e.g. coast protection works at East Lane, Bardsey; beach management work on the *Wash East Project*, King's Lynn and West Norfolk.

¹⁰ <https://www.uia-initiative.eu/en/uia-cities/greater-manchester>

¹¹ <https://cafs.org.uk/our-projects/33a-chapel-street-readyforrain/>

¹² <https://historicengland.org.uk/services-skills/heritage-action-zones/appleby/>

¹³ <https://www.north-norfolk.gov.uk/sandscaping>

¹⁴ <https://www.anglianwater.co.uk/siteassets/household/about-us/revised-strategic-direction-statement-2020-2045.pdf>

¹⁵ <https://historicengland.org.uk/services-skills/heritage-action-zones/appleby/>, <https://cafs.org.uk/our-projects/33a-chapel-street-readyforrain/>

¹⁶ <https://www.coasteast.org.uk/media/1375/bacton-sandscaping-a4-2pp-sheet-draft-1-240718.pdf>, <https://www.north-norfolk.gov.uk/sandscaping>

Many responses referred to the source of funding for initiatives and projects indicating that these were funded either completely by private investors or by mixed public-private funding.

- Private initiatives were financed by local stakeholders including landowners, local businesses, multi-sector partnership initiatives (e.g. Zurich Flood Resilience Alliance) and developers as well as through water company customers' water bills.
- Public-private funding schemes involved actors including: government and public bodies (e.g. Environment Agency, Historic England), Regional Flood and Coastal Committees (RFCCs), Local Authorities (e.g. Eden District Council, Hampshire County Council), charities and organisations without core government funding (e.g. Cumbria Action for Sustainability, Hampshire & Isle of Wight Wildlife Trust, the Great Shefford Flood Alleviation Association), private companies (e.g. water companies, local architects), National Lottery Community and Heritage Fund (funding through projects) and individuals (e.g. farmers, local land owners).

Several responses described factors that facilitated private investment in work to mitigate flood risk in local communities. The Deben Estuary Partnership noted that enabling development in local areas was essential to attract private investment to fund coastal protection. In addition, the creation of a formal Business Improvement District (a business-led partnership created to bring additional services to local businesses) has also led to business owners contributing to the costs of flood protection (e.g. *Sheffield Lower Don Scheme*, Yorkshire Area). Another option highlighted was the use of Local Enterprise Partnerships' Regional Growth Fund.

While some responses stated that private and private-public funding should be supported as it delivers beneficial flood and coastal erosion outcomes, some individual comments relating to funding from sources other than the public sector raised issues including:

- Belief that the financing of flood and coastal erosion management should be the responsibility of government and not private actors;
- The sums from private funding are usually small and thus don't make a significant difference;
- Some communities at risk of flooding and/or coastal erosion are too small to attract funding;
- Funding from water companies is constrained by performance outcomes as priorities are likely to be set where it helps to deliver their commitments.

15. What determines the success of flood and coastal erosion initiatives which have private and community contributions?

This question had 34 relevant completed responses, the majority from the public or private sectors. All the evidence and comments provided were anecdotal, reflecting the experience and opinions of the respondents.

Many responses named several **factors which determine the success of flood and coastal erosion initiatives which have private and community contributions**. The factors most frequently mentioned were meaningful and timely community engagement and contributors (i.e. the actors providing the funding) having a stake in the outcomes of the initiatives. Other factors mentioned included: knowledge of local communities at risk (e.g. about funding mechanisms and ways to manage flood and coastal erosion and build resilience independently within the community); community buy-in and ownership; good local leadership; complementary interests and goals among partners; availability of some form of core or seed funding for the initiative (to at least cover initial costs like project appraisals); and the ability/potential of the initiative to deliver multiple benefits (e.g. social, environmental and economic) and achievable outcomes.

Most commonly the respondents thought that **effective, timely and meaningful engagement of community with the scheme** plays an important role in the successful delivery of flood and coastal erosion initiatives which have private and/or community contributions. West Sussex County Council, the Chartered Institution of Water and Environmental Management, and Mike Potter of Ryedale District Council and Ryedale Flood Research Group mentioned that when schemes are being developed and implemented it is important to involve the community in consultations and discussions at the right time. Wessex Water reported that timely involvement could lead to more evidenced business plans and proposals. Some respondents commented that engagement of members of the community (including landowners, farmers, businesses, etc.) in delivering local flood improvements by using their local knowledge, work force and sources, gave people a sense of ownership in the scheme and in their own flood and coastal resilience.

Several respondents thought that for the initiatives to be successful it was important that potential **contributors** (i.e. actors providing the funding) **have stakes in the outcomes of the initiatives**. Stakes might include an interest (personal, economic or other) in an area/property (and related awareness of the risks of not taking action) or funds invested in the initiative and related awareness of potential profits/costs related to the outcome. For example, local businesses that are heavily embedded in a community and have critical infrastructure linked to their site that cannot be easily moved, will have a great interest in schemes that reduce flood risks to their assets.

Anglian Water and South West Water both said that the delivery of a wide variety of benefits from flood and coastal erosion initiatives has a positive effect in terms of securing funding from a range of stakeholders. Two examples (Oxford Flood Alleviation Scheme and Coastal Partnership East's work on the East Anglian Coast) supported this argument.

Several respondents highlighted the importance of key stakeholders having a common goal of finding mutually beneficial outcomes from flood and coastal erosion initiatives. It

was noted that aligned or complimentary interests between stakeholders is essential to ensure success.

Other factors determining the success of flood and coastal erosion initiatives which have private and community contributions were mentioned, including: the location and nature of local economy (the scarcity of private investors in rural areas makes these initiatives less likely); maturity of schemes (readiness to be implemented once funding is in place); diversity of funders and beneficiaries; networking and business skills of project leads.

16. What could be done to encourage private and community funded initiatives and help them succeed?

This question had 43 completed relevant responses. The majority of the responses were from the public or private sectors. All but one of the responses and evidence provided were anecdotal but reflected the operational experience of the respondents.

When asked what could be done to encourage private- and community-funded initiatives and help them succeed, respondents most commonly mentioned **increasing the knowledge of local communities at risk of flooding and coastal erosion**, including: providing advice, guidance and training to local people in relation to flood and coastal erosion (e.g. to improve understanding of the local catchment area and factors/locations contributing to local flooding and coastal erosion); continuous communication and engagement with local communities (e.g. through long-term programmes of coastal/flood risk awareness, repair, maintenance and preparedness); raising awareness and understanding of (individual) risks (to encourage people/businesses to take ownership and control over their situation to reduce risks or increase asset value); improved availability and awareness of relevant information (e.g. in relation to good practices, funding programmes etc.); and better understanding of costs related to the events like floods or (sudden) loss of land due to coastal erosion.

Closely linked to elements associated with knowledge, and as described in responses to question 14, **establishing long term meaningful community engagement** was mentioned by several respondents as one of the things that could be done to support private- and community-funded initiatives and help them succeed. One example was a robust assessment of the local capacity for funding and scheme delivery and fostering of community spirit to ensure future participation.

Provision of core or seed funding was also quite frequently mentioned as something that could be done in support of private and community funded initiatives. Several responses suggested that the provision of small grants for project appraisals, studies, engagement of experts (who can bring together funding and beneficiary partners) and the organisation of community flood/coastal groups might be beneficial. In addition, it was suggested that guarantees from public authorities of allocated funds in future partnership projects would increase the confidence of private sector investors.

Many responses provided suggestions for **different financial tools and mechanisms**: green finance; Local Enterprise Networks; Natural Infrastructure Schemes; a new Green

Infrastructure Bank for public authorities; partnerships or community interest companies between authorities (e.g. in locations with a limited number/type of beneficiaries); financial and tax incentives for businesses coordinating with local risk management authorities; funding mechanisms with wider focus on community assets in addition to residential property; enabling contributions in instalments (if the upfront cost is too high); and facilitating the use of Grant in Aid funding.

The US National Flood Insurance Program's Community Rating Scheme was mentioned by FloodRe as an example of reducing insurance premiums as an incentive to encourage community members to contribute to a scheme.

Many responses referred to a **need for policy measures** to encourage private- and community-funded initiatives. The measures mentioned included: development of project portfolios that enable investment by private organisations; improvement of the consenting process to increase transparency; revision of Special Levy funding (to consider its exclusion from the local authority referendum cap) and enabling the raising of Special Drainage Charges by risk management authorities; and improving the alignment of local planning/ priorities on flood risk and coastal erosion management and private sector investment cycles.

Some responses mentioned the importance of **early engagement of private partners** in the development of flood risk and coastal erosion schemes in order to make informed decisions and manage the expectations of all participants.

Other things mentioned in responses as possible ways of encouraging private- and community-funded initiatives included: local leadership; local policy for the maintenance and replacement of short-lived risk management measures like woody debris dams; communication of the benefits and costs of successful schemes; better communication on flood and coastal erosion risks and the wider benefits of private- and community-funded schemes more generally; developing schemes which deliver multiple benefits and outcomes (e.g. social, economic, environmental, etc.); and avoiding bureaucratic procedures in the process of applying for schemes.

F. Developer contributions

This section captures the main points from responses to questions seeking to identify the extent of developer contributions and the existing barriers to securing and using these contributions for funding works to manage flood risks. In addition, the evidence in this section explores cases where funds are pooled for building large infrastructure for mitigating flood risk and coastal erosion as well as those where ongoing maintenance costs of flood alleviation measures are covered. The key messages are:

- There are a range of issues, concerns and challenges with the section 106 (S.106) process and using developer contributions to fund works. Suggestions for overcoming the issues identified included the establishment of a centralised database of S.106 contributions, to allow the use of these contributions to be monitored.
- Responses identified a range of barriers to securing developer contributions. The main barriers were: the uncertainty and lack of transparency of the system for securing S.106 contributions; developers avoiding making contributions for locations beyond their site boundary; affordable homes targets being given greater importance than flood resilience; and the inability to secure funds from developers for the lifetime of the development. Most responses included suggestions for overcoming the barriers identified.
- Examples were provided of developers covering the ongoing maintenance costs of flood alleviation measures and it was suggested that these costs are generally addressed in all new developments.

17. Please provide evidence on the extent to which contributions being made by developers (through section 106, Community Infrastructure Levy and other means) are being used to fund works to manage the flood risks.

There were 25 relevant responses to the question, most from public sector organisations and some from the private sector. Many responses gave evidence about the contributions made by developers to fund works to manage flood risks. Various approaches to securing funds were highlighted along with problems encountered.

Examples where developer contributions have been used to fund works to manage flood risks include the East Riding of Yorkshire where the Council is currently delivering a £5m scheme to address flooding issues at Pocklington. This has been supported by a £3m contribution from developer Persimmon Homes through the S.106 agreement. Because the scheme was not fully developed at the time of the negotiations on the S.106 agreement, a final cost for the scheme element was not available to support the negotiations around size of the contribution. This meant that the Council had to secure FDGiA, Local Levy and Local Growth Funding to ensure the scheme could be progressed.

Hampshire County Council works with its district partners to ensure that flood risk reduction is identified through infrastructure strategies and delivery plans. Opportunities are sought to resource this through the Community Infrastructure Levy (CIL).

Infrastructure charges were highlighted as a way forward for funding works linked to flooding. An approach used in Weymouth was to adopt policies which set aside S.106 contributions to cover future infrastructure requirements to address sea level rise. Recently, the authority has committed to spend 40% of its CIL towards flood risk needs. Furthermore, a phased programme of investment is being prepared to ensure development and regeneration are sustainable for at least 100 years.

Examples of developer contributions to FCERM works include Port Authority contributions to offset coastal erosion and habitat loss from the London Gateway Port. A further example are the compensation and mitigation arrangements by Bristol Ports for the new Bristol Deep Sea Container Terminal. Compensation works will be undertaken to help local people whose homes are increasingly under threat from encroachment by the sea and coastal flooding.

In Suffolk, a CIL grant was secured by a local partnership to help fund the cost of a preliminary survey and design works in preparation for a major renovation of a strategic section of estuary flood defence.

A further example was given of a developer contributing to the local IDB to cover long-term management and maintenance services for flood alleviation measures in the Marston Vale Surface Water Plan.

Another means of securing funding was illustrated in Cambridgeshire where small-scale betterment works (such as culvert upsizing and repair work) have been undertaken by developers as '*good will gestures*'. In-kind contributions from developers were reported to work well by several respondents, although they noted that the burden of contributing to flood management falls disproportionately on a few developers.

Issues, concerns and challenges about the S.106 process and using developer contributions were mentioned in around half of the responses to this question. Challenges relating to the use of S.106 included the complexity of the system and the limited scope for use on flood and coastal protection projects. Several responses considered that the mechanism was not fit-for-purpose. In particular, use of S.106 for site level mitigation was not seen to be compatible with larger scale FCERM projects.

One response noted that developers can use contributions to facilitate development within areas of significant flood risk that otherwise would not have been permitted. If this is the case then such developments may not be accounting for the full environmental, social and economic risks and impacts.

A challenge highlighted by one response was that of unlocking additional funding from private developers where there is no direct risk of flooding, but significant indirect impacts. In the case of the Oxford Flood Alleviation Scheme, the developers passed on these risks, and the responsibility for funding, to the tenants of the development.

Some responses pointed out that developer contributions did not reach rural areas or landowners. For example, CIL payments are not passed on to the landowners who accommodate flood waters from developed land.

A few respondents highlighted the need to have developed flood schemes at an advanced stage of planning early on in the negotiations to ensure that developer contributions are based on detailed costings.

Suggestions for overcoming difficulties in securing developer contributions for flood management works included creating a centralised database of S.106 contributions that could be used to identify where funds are due, have been received or have been spent on works to manage flood risks.

A few responses indicated that it was important that local plan policies on S.106 should include a reference to using developer contributions to manage flood risk, in order for the contributions to be used in this way.

While developer contributions towards SuDS were considered positive, a few respondents expressed concern that these had a negative impact on opportunities for obtaining S.106 funds for downstream flood improvements as developers could argue that they were not making the situation worse for off-site land. Concern was also expressed over the lack of long-term maintenance for SuDS and the potential impact downstream when flood defence structures fall into disrepair.

One academic institution reported on discussions with several local authorities about using developer contributions for climate change adaptation. The idea is that developments within a local area could collectively fund adaptation to coastal erosion and flood risk.

18. What are the barriers to securing and using developer contributions to ensure that new developments are safe for their lifetime, taking account of climate change? How can these barriers be overcome?

There were 28 relevant responses to this question, most from the public sector and from private sector companies.

Barriers to securing developer contributions that were mentioned in the responses included the system for securing S.106 contributions. This was considered by some to be uncertain and lacking in transparency. It has been found to be vulnerable to challenge on viability grounds and can be re-visited and re-negotiated further down the line. The viability of development was often cited as a major barrier to securing contributions. CIWEM pointed out that the recent changes in the NPPF relating to S.106 transparency and viability assessments should help in securing developer contributions. However, issues may remain if developer contributions continue to come mainly from developer profits rather than via the uplift in land values that occur once permission is granted.

Several responses highlighted that, where possible, developers avoid making contributions, for example by only being concerned with what happens within their site

boundary. This can result in the potential wider impacts of the development on flood risk being ignored or underestimated.

Other drivers and pressures on developer contributions, such as affordable homes targets, were said by several respondents to be given greater importance than flood resilience. The problem of funds not being generated from development in sufficiently large quantities for FCERM projects was also mentioned. The inability to secure funds from developers for the lifetime of the development was raised in several responses, along with the issue of how the '*lifetime of a development*' was to be defined. Respondents felt that difficulties in securing contributions was not helped by the lack of information on the lifetime costs of incorporating SuDS in developments and the issue of identifying who should be responsible for the medium to long term maintenance and funding of drainage or flood management schemes.

One response suggested that local authorities need to include specific uses for CIL in their policies in order to secure contributions.

CIWEM noted that while the NPPF has been updated to provide for 'betterment', so far it has not been picked up through many planning applications. Legal advice suggests that contributions for flood risk betterment works cannot be sought through obligations as they go beyond required planning considerations.

The timing of new development and flood risk management works and coordination in securing contributions was also raised in responses.

Barriers to using developer contributions were raised in a few responses. The barriers included: the loss of the knowledge held by internal drainage boards on how flood waters flow and work; county councils sitting on developer contributions and not being transparent about how much they have and what they plan to do with it or when; and the adoption and maintenance of sustainable drainage systems over the long term (especially in cases where the responsibility for SuDS has been passed to a maintenance company which ceases to operate after a few years).

Suggestions for **overcoming barriers** were covered in around half of the responses, with each respondent generally offering a different idea.

The Cornwall Catchment Partnership suggested increasing the number of statutory consultees in the planning process to include organisations such as the local water company.

A member of Ryedale District Council, mentioned the need for national policy covering issues such as compulsory SuDS, including maintenance responsibilities. Another response advocated Government advice to help developers switch from conventional to new approaches to drainage systems. Furthermore, by strengthening guidance and policy, it was suggested that might be possible to require, or strongly encourage, contributions to provide betterment to existing communities.

The GLA suggested the inclusion of strategies for addressing flood risk in Local Plans to be treated as enabling infrastructure or community assets that are necessary as part of new developments; this should help make it easier to fund via developer contributions.

The RSPB suggested that where natural flood management programmes are being considered, a policy or proposal for net gain would provide for a more coherent and upfront delivery mechanism.

The Environment Agency highlighted its policy for securing partnership funding contributions for FCERM infrastructure through an agreement between the Environment Agency and a developer. The Environment Agency considers itself to be in a strong negotiating position whilst a planning application remains undetermined. As goodwill and persuasion is relied upon to secure contributions once permission is granted, this approach would benefit from having a better way of connecting partnership funding agreements to the granting of planning permission. The Environment Agency further suggested ring-fencing commuted sums for the adoption and maintenance of SuDS over their lifetime.

The example was given of the successful model used by the Bedford Group of IDBs, where the developer is responsible for the design, construction and for funding the maintenance of SuDS.

Salford City Council reported that use of planning conditions, rather than obligations, had been known to secure flood storage as part of a development. The example was given of Green Grosvenor Park in Lower Broughton, Salford, which was created as part of a large, phased development and which provides flood storage to compensate for raising land elsewhere in the development.

Involving flood risk officers in planning discussions and developer meetings was mentioned as a helpful way forward, including the ongoing need for raising awareness of the direct and indirect benefits of FCERM to both planners and developers.

Anglian Water gave the example of Wisbech where new approaches have been developed to deal with flood risk challenges. In enabling housing growth, collaboration is ongoing between all relevant partners (Local Authorities, development companies and developers) to create a deeper understanding of flood risk with the aim of designing a climate resilient community for the future.

19. Please provide examples of cases where authorities have sought (successfully or unsuccessfully) to pool contributions to build larger pieces of flood or coast infrastructure that benefit more than one local authority area.

There were 17 relevant responses to this question, most from public sector organisations.

Thames Estuary 2100 (TE2100) was given as an example of a project which is pooling funds across London and the Thames Estuary to pay for defences that will benefit multiple Local Authorities¹⁷.

Other examples were: the *Wrangle Sea Bank Project*; the Oxford Flood Alleviation Scheme where contributions were made on the basis of availability of funds rather than the benefits accrued by each organisation; and multi-agency cooperation and funding at Pickering (Yorkshire).

Collaboration with funding was reported to have occurred across all FCERM schemes in Norfolk and Suffolk (e.g. the *Benacre & Kessingland Flood Risk Management Project* in Suffolk).

The *North Wales Tidal Energy scheme* was given as an example of a project that has gained the support of Denbighshire and Conway Councils and the North Wales Economic Ambition Board in obtaining Government funding for a feasibility study.

Several respondents mentioned cross-boundary initiatives, other than schemes, where funds were being pooled. These included: Shoreham Port Joint Area Action Plan; East Solent Coastal Partnership; Coastal Partnership East and other Coastal Partnerships that pool funds and expertise; the Poole & Christchurch Bays SMP-Wide Beach Management Plan; and the East Riding of Yorkshire, Hull and Haltemprice Flood Risk Management Plan, which paved the way for a series of flood alleviation schemes (Willerby and Derringham Flood Alleviation Scheme, East Ella Flood Alleviation Scheme, and Cottingham and Orchard Park Flood Alleviation Scheme) with funding secured from a range of sources.

An example of a scheme undertaken by one Local Authority which also benefits neighbouring authorities was the *Blue Green Infrastructure Project* which is being undertaken by Nottingham City Council.

20. Where flood alleviation measures have been put in place as part of a new development, have the ongoing maintenance costs been provided for under these arrangements?

There were 19 relevant responses to this question. The majority of responses were from public sector organisations with most others from the private sector.

Examples of provision of the ongoing maintenance costs of flood alleviation measures were covered in over half of the responses.

Several responses said that ongoing maintenance costs were generally addressed in all new developments, often passing responsibilities to a special purpose vehicle or company.

¹⁷ <https://www.gov.uk/government/publications/thames-estuary-2100-te2100>

Some responses indicated that where flood alleviation measures have been put in place as part of a new development, they have remained under the ownership and responsibility of the Local Authority or IDB, which has then had responsibility for ongoing maintenance.

Coastal Partnership East noted that at Sizewell C, the Local Authority made it clear that maintenance costs for the management of flood and coastal risk must be funded by the business owners.

At Green Port Hull development, the developer paid for and constructed a new flood defence and a legal agreement was put in place requiring them to inspect, maintain, repair and, as necessary, replace the flood defence over a period of 100 years.

Challenges to ensuring the provision of ongoing maintenance costs of flood alleviation measures were highlighted in several responses.

A major issue raised was that once the original developers have completed the development and passed liabilities to separate maintenance companies, those maintenance companies don't necessarily have the funds to meet their obligations. As a result, there is a significant legacy issue building up. A few responses indicated that ongoing maintenance costs were not being adequately covered and there was a risk to the long-term effectiveness of measures (if not maintained).

United Utilities raised issues about the maintenance of and responsibility for SuDS. If SuDS are not adequately maintained by the company responsible for doing so, then the connecting surface water sewers may be unable to discharge freely into them, resulting in flooding. While SuDS may be adopted and maintained by water companies there may still be a requirement for community funded maintenance of parts of the system. To avoid risk of flooding, all elements of the sewer and drainage system needs to be maintained with clear lines of responsibility and transparency of funding. The point was made that landowners are not compensated for ongoing downstream benefits of flood alleviation measures where they provide a service by allowing floodwater over their land.

G. Managing financial risks from flooding

This section covers the disclosure of financial exposure to flood risk by public and private organisations and the potential barriers to this. The key messages are:

- A limited number of examples were provided of organisations disclosing their financial exposure to flood or other climate risks.
- A wide range of evidence was provided on tools, actions and stakeholders that have an important role in enabling financial disclosure of flood risks.
- Commercial sensitivity appears to be the main barrier to identifying and disclosing financial exposure to flood risks. Other potential barriers that were prominent in the responses include: limited information and knowledge; the issue of time availability and effort; and absence of cross-departmental collaboration. Some respondents suggested actions that could help to overcome these barriers, however strong support for a particular action is not evident.

21. Please provide examples of public and private organisations which are already disclosing their financial exposure to flood or other climate risks and how they go about it.

This question had 18 relevant completed responses, the majority of which were from public and private sector organisations. Most of the respondents drew on anecdotal or operational knowledge of the topic. Six provided links to evidence or uploaded documents.

The limited number of organisations disclosing their financial exposure to flood or other climate risks was mentioned in many of the responses. Some respondents highlighted the issue of limited practice of disclosing financial exposure to flood or other climate-related risks among public and private organisations. The Environment Agency suggested that it was very unlikely that large private organisations would disclose their financial exposure to flood risk unless they were required to, for example, through mandatory legislation or on request from investors. However, the few examples provided of organisations disclosing financial exposure to flood or other climate-related risks were from water companies including Affinity Water, Anglian Water and Yorkshire Water.

Many respondents emphasised **the importance of the Taskforce on Climate-related Financial Disclosure (TCFD)**. According to Yorkshire Water Services a significant number of companies have now committed to disclose their financial exposure to flood or other climate risks against the TCFD guidelines. This has led to several reviews of company disclosures already being published. Signatories to the TCFD frequently disclose their flood risk using the TCFD reporting framework. It was also noted that the TCFD is publishing annual status reports which provide an overview of how organisations are implementing its recommendations.

It was also noted that in 2015 the Federation of Small Businesses reported the results of a survey of the financial impacts of climate risk on SMEs¹⁸ which found a low level of awareness and action among small businesses. It was acknowledged in several responses that TCFD does rely on a relatively high level of climate risk awareness from both investors and asset owners although some respondents highlighted the value of TCFD as a tool for encouraging organisations to disclose their financial exposure to flooding or other climate risks (particularly by prompting investors to ask questions).

Ongoing work investigating flood and climate risk disclosure among private organisations was noted in various responses. The Grantham Research Institute is doing a study as part of the Third UK Climate Change Risk Assessment investigating risk disclosure by the private sector. Other studies noted by respondents include a high-level risk assessment of current flood risk by Network Rail which includes assessment of the costs that may be associated with mitigating the risk. Finally, the insurance industry is also looking at different scenarios to assess if their portfolio will be materially impacted. Some respondents said that **the insurance sector could have an important role in the financial disclosure of flood risks** for their clients. However, this would require more transparent relationships between insurers and their customers. British Insurance Brokers' Association noted that the Association of British Insurers produce aggregated information on flood claims from UK clients.

22. What are the barriers to identifying and disclosing financial exposure to flood risks and how could they be overcome?

There were 18 relevant responses to this question, with four additional links to evidence. The majority of the responses to this question were from public and private sector organisations.

The **main barrier to identifying and disclosing financial exposure to flood risks** was recognised in many responses to be the issue of commercial sensitivity and the potential negative financial impact for organisations, including on investments, securing future contracts, business share prices, property values and risk profiles which affect insurance costs and financial borrowing rates.

Barriers related to limited information and knowledge to identify and disclose financial exposure were also reported. These included: the lack of understanding of financial exposure to flood risk in a wider flood resilience context; lack of knowledge of the benefits of investing in resilience; lack of information on the baseline quality of assets (further leading to increased costs in correcting baseline data deficiencies and operating monitoring programmes); lack of futures maps on national flood risk or sea level rise.

¹⁸ Federation of Small Businesses, 2015. *FSB warning as more than half of small firms without flood plan* (press release FSB PR 02/2015). Blackpool, FSB.

Some respondents considered **the issue of time availability and effort** as a barrier. Businesses lack the capacity to investigate minor flooding incidents and the benefits of investing in resilience as they seek to re-establish their operations as soon as possible.

Coastal Partnership East noted that the **absence of cross-departmental collaboration** is undermining the ability of the public sector to effectively identify and disclose financial exposure. Particularly the often-siloed Local Authority departments do not adequately address interconnected risks on a macro scale (e.g. climate change).

Uncertainties about future risk in regard to climate trajectories and potential tipping points as well as assumptions about future exposure and their uptake on private level adaptation were highlighted as key **technical challenges in modelling flood risk**.

In looking at **ways to overcome the barrier of commercial sensitivity**, some responses stressed that the stigma of reduced land value and risks for future use of a historically flooded area should be challenged. This could be achieved by demonstrating that should sufficient investment be made, there are potentially no more risks for such areas than for those that have not previously suffered from a flooding event. Other recommendations of how to overcome commercial sensitivity included insurance provision, and/or a clearer commitment by Government to provide '*state of emergency*' support in given flood scenarios.

Key suggestions for **overcoming the information and knowledge barrier** included: the need to steadily improve the quantity/quality of flood risk data while ensuring access to good national mapping; providing guidance on data collection to give a nationally comparable data set across sectors; applying a systems-thinking approach to support a better understanding of the interactions between aspects of flood resilience and the financial risks of flooding; updating guidance to obtain more uniform, meaningful and quantified reporting of risks (including financial exposure) as part of the Adaptation Reporting Power (ARP).

The Grantham Research Institute suggested that improving risk models to take account of future risk and climate change as well as ensuring a better understanding and integration of human behaviour in risk assessments could help to **overcome technical challenges in modelling flood risk**. The Grantham Research Institute supported this argument by referring to a study by Aerts et al. (2018)¹⁹ and a report by Cambridge Institute for Sustainability Leadership²⁰.

¹⁹ Aerts, J.C.J.H. et al. 2018. Integrating human behaviour dynamics into flood disaster risk assessment. Nat. Clim. Change 8, 193–199.

²⁰ <https://www.cisl.cam.ac.uk/resources/sustainable-finance-publications/physical-risk-framework-understanding-the-impact-of-climate-change-on-real-estate-lending-and-investment-portfolios>

Appendix 1: List of individuals and organisations that provided evidence

Please note that this list does not include individuals and organisations that asked for their responses to remain confidential

1	Association of Drainage Authorities (ADA)
2	Affinity Water
3	Alde and Ore Association
4	Alistair Hunt, University of Bath
5	Anglian Water
6	Johnny Beck
7	British Geological Survey
8	British Hydropower Association
9	British Insurance Brokers' Association (BIBA)
10	Sally Brown and Charlie Thompson, University of Southampton
11	Tony Burch
12	Channel Coastal Observatory, National Network of Regional Coastal Monitoring
13	The Chartered Institution of Water and Environmental Management
14	Coastal Group Network for the Environment
15	Coastal Partnership East (North Norfolk District Council, Great Yarmouth Borough Council & East Suffolk Council working in partnership)
16	Cornwall Catchment Partnership
17	Country Land and Business Association (CLA)
18	Anthony Crawshaw
19	Deben Estuary Partnership
20	Devon County Council
21	East Riding of Yorkshire Council

22	Environment Agency
23	Flood Re
24	Grantham Research Institute
25	Greater London Authority (GLA)
26	Greater Manchester Combined Authority (GMCA)
27	Hampshire County Council
28	Paul Hayden, Chair, RFCC Anglia Eastern
29	Hemyock Castle, Devon
30	Historic England
31	Professor Janet Hooke, University of Liverpool
32	ICE blue
33	JBA Consulting
34	Knights plc
35	Local Government Association (LGA)
36	London Drainage Engineers Group (LoDEG) - part of London Technical Advisers Group
37	London Borough of Waltham Forest
38	Gerard Matthews
39	Phiala Mehring, Lodden Valley Residents Association and Trustee National Flood Forum
40	Mott MacDonald
41	National Farmers Union (NFU)
42	National Flood Forum
43	National Trust
44	Natural England
45	Larissa Naylor, University of Glasgow
46	Network Rail
47	Northumbrian Water Ltd

48	Nottingham City Council
49	Dr Evangelos Ntontis, Canterbury Christ Church University, School of Psychology, Politics & Sociology
50	Our Amble (Ltd)
51	Port of London Authority
52	Mike Potter, Ryedale District Council and Ryedale Flood Research Group
53	Ed Rollason, School of Science, Engineering, and Design, Teesside University
54	Royal Society for the Protection of Birds (RSPB)
55	Salford City Council
56	South Tyneside Council
57	South West Water Ltd
58	Southern Coastal Group
59	Suffolk Coast Against Retreat (SCAR)
60	Swanage Coastal Change Forum
61	United Utilities
63	Water UK
63	Wessex Regional RFCC and Wessex Area Environment Agency
64	Wessex Water
65	West Sussex County Council Lead Local Flood Authority
66	Holly Whitelaw
67	Iain Thomas Wolkowski
68	Yorkshire Water Services
69	Zurich Insurance

Appendix 2: List of abbreviations

ARP	Adaptation Reporting Power
BGS	British Geological Survey
CfE	Call for Evidence
CCMA	Coastal Change Management Area
CPA	Coastal Planning Authority
CIWEM	Chartered Institute of Water and Environment Management
CIL	Community Infrastructure Levy
FCERM	Flood and Coastal Erosion Risk Management
FDGiA	Flood Defence Grant-in-Aid
FRMC	Flood Resilience Management for Communities
GFDRR	Global Facility for Disaster Reduction and Recovery
GLA	Greater London Authority
GMCA	Greater Manchester Combined Authority
IDB	Internal Drainage Board
NERC	Natural Environment Research Council
NPPF	National Planning Policy Framework
RFCC	Regional Flood and Coastal Committee
RSPB	Royal Society for the Protection of Birds
S.106	section 106
SMP	Shoreline Management Plan
SME	Small and Medium Enterprise
SuDS	Sustainable Drainage System
TCFD	Taskforce on Climate-related Financial Disclosure