Department for Environment Food & Rural Affairs

Collingwood Environmental Planning

Hillingdon London

fhrc Flood Hazard Research Centre

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Environment Agency

Flood and coastal erosion risk management research and development framework: working with communities

Literature review

Project FRS19209/R2

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T: 03708 506506

Email: enquiries@environment-agency.gov.uk

Author(s):
Clare Twigger-Ross, Rolands Sadauskis, Paula Orr, Rebecca Jones, Simon McCarthy, Dennis Parker, Sally Priest and Jonathan Simms

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Research contractor:
Collingwood Environmental Planning

Environment Agency's Project Manager:
Lydia Burgess-Gamble

Theme Manager:
Hayley Bowman

Collaborator(s):
Flood Hazard Research Centre

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Professor Doug Wilson
Chief Scientist and Director of Research, Analysis and Evaluation

Executive summary

The Environment Agency, the Department for Environment, Food & Rural Affairs (Defra), Natural Resources Wales and the Welsh Government have a joint flood and coastal erosion risk management (FCERM) research and development[1] (R&D) programme that provides applied research for all risk management authorities in England and Wales.

The joint FCERM R&D programme frequently produces R&D frameworks to cover specific topics where demand for applied research is high. Research frameworks involve carrying out detailed literature reviews and gap analysis to help shape existing and future research projects and to prioritise and catalyse future R&D funding. The purpose of this project is to develop a communities and FCERM R&D framework.

This report is the first stage of this project. It is a literature review and gap analysis that will ultimately lead to the development of a project delivery road map (a prioritised list of project) and short summaries of future research projects.

This literature review covered 6 different types of FCERM activity that communities are involved in:

- Managing flood risk assets (chapter 4)
- Preparing for, responding to and recovering from incidents (chapter 5)
- Taking part in decisions, designs and funding for schemes (chapter 6)
- Managing land to achieve flood risk benefits (chapter 7)
- Preparing and adapting homes to reduce flood impacts (chapter 8)
- Taking part in conversations about long-term adaptation (chapter 9)

The literature review and gap analysis was also supplemented with 7 expert interviews and a stakeholder workshop that identified the following research gaps (chapter 10 and 11):

1. **Identifying and evaluating individual members of the public and groups working with RMAs in each of the 6 FCERM activities across England and Wales -** Who is participating? How are they participating? How effective is the participation? How can successes and challenges be shared and built upon?
2. **Sustaining participation** - How do people get involved and stay involved in flood groups? What does 'sustained participation' look like for all types of activity? What are the influencing factors and how can it be sustained?
3. **Flood recovery -** How are individual members of the public and groups engaging in flood recovery? What types of activities and actions are they carrying out? How can those activities be supported to increase personal resilience to help people recover more quickly, specifically for those who have to relocate? How can the most vulnerable be supported?
4. **Farmers and participation in FCERM, specifically natural flood management (NFM) and maintenance of assets -** How do farmers make decisions about natural flood management? What are the factors that influence their decisions? How do farmers work with communities to maintain assets? What tools and approaches do RMAs need to help engage and work with farmers and landowners, specifically around NFM?
5. **The role of emotions and identities (individual and group) in participation -** How do emotions, personal and social identities influence participation? What are the

[1] The programme is run by the Environment Agency, Defra, the Welsh Government and Natural Resources Wales. It aims to serve the needs of all FCERM authorities in England and Wales.

psychological challenges associated with place detachment [2]? Loosening ties or forming attachments to altered or completely different places is an aspect of climate change adaptation - how does this affect people's participation in conversations about long-term adaptation?

6. **Managing the emotional aspects of flooding for professionals** - How do professionals (for example, loss adjustors, surveyors, builders) and RMAs manage and cope with the emotional aspects of flooding? What training and support might be appropriate so that they can liaise effectively with individual members of the public and groups during recovery?
7. **Influence of participation on FCERM decision making: schemes, strategies and long-term adaptation** - What influence do individual members of the public and groups have on FCERM decisions? How do different types of participation (from consultation to co-creation) really influence FCERM decision making? How do those processes work and whose views are represented?
8. **The role of community flood knowledge** - What role can/does a community's knowledge about flooding play? To what extent is community flood knowledge taken into account and how does it influence decisions taken? How do communities learn about flood risk and how can that help them participate in RMAs' assessments and modelling?
9. **Links between formal statutory consultation processes/wider political processes and local participation in FCERM activities -** What are the links between statutory processes and participation in FCERM activities, for example, within planning systems or for flood schemes? How do these interact? How can they complement each other and how does trust in one relate to action in another?
10. **Characteristics of RMAs that influence participation in FCERM activities -** What are the characteristics of institutions (for example, RMAs) that help/hinder individual members of the public and groups participate? How do organisational cultures, including the language used by RMAs, encourage or restrict people getting involved in the 6 FCERM activities? What is the role of trust? What are the specific issues for NFM?
11. **Decision making in flood recovery -** How do the insurance industry and related professionals make decisions during flood recovery and also when members of the public buy insurance? How are members of the public and communities involved in this?
12. **Cost and benefits of participation -** What are the financial costs and benefits of participation for individual members of the public and groups and RMAs? How to evaluate costs and benefits of the different activities? What is the value given to this work by the local community, the Environment Agency and other RMAs and by the individuals involved?

The next step, discussed in chapter 12, is to use these findings to help develop the research framework. This will produce a long list of projects (up to 10) and an associated roadmap, which will identify potential funding sources and ways of implementing the projects (delivery mechanisms).

[2] 'the intentional dissolution of ties to place' (Nicolosi and Corbett 2017, p. 93)

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- **Interviewees:** Prof. Neil Adger (University of Exeter), Dr Tim Harries (University of Kingston), Dr Kerry Waylen (James Hutton Institute), Phiala Mehring (National Flood Forum Vice Chair), Mhari Barnes (National Farmers Union) and Steve Smith (Icarus Collective).
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1 Introduction

1.1 Background

The Environment Agency, the Department for Environment, Food & Rural Affairs (Defra), Natural Resources Wales and the Welsh Government have a joint flood and coastal erosion risk management (FCERM) research and development[3] (R & D) programme that provides applied research for all risk management authorities in England and Wales.

The joint FCERM R&D programme frequently produces R&D frameworks to cover specific topics where demand for applied research is high. Research frameworks involve carrying out detailed literature reviews and gap analysis to help shape existing and future research projects and to prioritise and catalyse future R&D funding.

The purpose of this project is to develop a communities and FCERM R&D framework that will summarise the main research gaps in this area of FCERM. These will be identified through a detailed review of current science and set out a roadmap for implementing and funding projects to fill these gaps.

This report is the first stage of this project. It is a literature review and gap analysis that will ultimately lead to the development of a project delivery road map (a prioritised list of projects) and short summaries of future research projects.

1.2 Strategic context

Over the last 10 years, there has been a significant change in how FCERM is carried out, with a greater emphasis placed on risk management authorities (RMAs), communities and non-governmental organisations (NGOs), such as the National Flood Forum, working together, taking greater responsibility for managing flood risk locally.

There are numerous policy drivers (factors that influence policy) (Table 1.1) that emphasise the need for RMAs to work closer with and more effectively involve communities who are at risk of flooding. For example, the 25 Year Environment Plan and the FCERM strategies for England and Wales both have a focus on reducing the impacts of all sources of flooding and coastal erosion to communities to help make them more resilient in the future. In Wales, the Well-being of Future Generations (Wales) Act 2015 and Planning (Wales) Act 2015 encourage partnership working, collaboration and a long-term approach.

The Environment Agency's FCERM strategy reflects these trends, emphasising the need for a different philosophy; one of shared responsibility, placing individual members of the public at the heart of developing solutions.

The FCERM strategy for England says:

> *"We can't prevent every flood or change to our coast. Together people, businesses, public and voluntary sectors need to support each other to prepare for the unavoidable flooding and loss of homes to the sea. As climate change increases, we'll need to mobilise and empower a nation of climate*

[3] The programme is run by the Environment Agency, Defra, the Welsh Government and Natural Resources Wales. It aims to serve the needs of all FCERM authorities in England and Wales.

> *champions that can better take responsibility for dealing with the risks posed by flooding and the erosion of our coastline."* (Environment Agency, 2020).
>
> *"Resilience includes accepting that in some places we can't eliminate all flooding and coastal change, and so we need to be better at adapting to living with the consequences."* (Environment Agency, 2020).

This is echoed by the FCERM strategy for Wales:

> *"Whilst measures are designed to be clear and deliverable over the next decade, the Strategy has been drafted with a longer-term, strategic view, recognising the nature of flood and coastal erosion risk with respect to the challenges of climate change."* (Welsh Government, 2020, p. 4)

Currently, communities in England and Wales are involved in FCERM in a variety of ways such as:

- **coastal action groups** – local people working with risk management authorities to develop shoreline management plans (SMPs)
- **consultations on flood schemes** - members of the public responding to consultations on proposed flood schemes in their local area
- **people helping each other locally during and after a flood,** for example:
    - helping neighbours move belongings during a flood
    - providing emotional, social and physical support during and after a flood
    - coming together to raise awareness of the risks of flooding in a community
- **flood action groups** - formed after major floods to recommend actions to reduce flood risk in their local area
- **flood wardens** - people training to be flood wardens in their local areas
- **volunteer groups** - local people coming together as volunteers to maintain ditches or to do practical conservation work to help reduce the risk of flooding locally

The important point here is that involving the community in FCERM is complex. It varies across areas and social demographics, and is typically a mix of informal and formal actions. It can be driven from the bottom up by local individuals and groups or top down by RMAs. The objective of participation in FCERM will vary from 'instrumental' (getting a task done) to 'relational' (building relationships and networks). Communities can sometimes feel as though engagement is being 'done to them' by RMAs, and RMAs can feel that there is a lack of response from local people.

This research framework aims to develop projects that can break down these complexities and provide useful evidence, so that communities and RMAs can work together more to manage the risk of flood and coastal erosion.

Table 1.1 Summary of policy drivers

UK and national assessments, programmes, Acts and plans	
UK Climate Projections 18 (UKCP18)	UKCP18 gives a comprehensive picture of how the climate could change in the UK, including increased sea level rise and risks of flooding impacting on communities.
UK Climate Change Risk Assessment (Climate Change Risk Assessment, 2017)	Climate change is likely to increase flood risk in England from the 4 main types of flooding - fluvial (river), coastal, surface water and

UK and national assessments, programmes, Acts and plans	
	groundwater. Sea level rise and potential changes in storm patterns are likely to increase coastal erosion rates in many areas.
The UK National Adaptation Programme and the Third Strategy for Climate Adaptation Reporting (2018)	This highlights the risks and the approach set out in the 25 Year Environment Plan and details an overall approach of prevention, protection, adaptation, response and acceptance.
Well-being of Future Generations (Wales) Act 2015	In this Act, there are goals for a resilient Wales and a Wales of cohesive communities. While there is nothing directly about engaging communities in FCERM, each public body (for example, Natural Resources Wales) has to show how it is meeting these goals.
Welsh Government Climate Change Adaptation Delivery Plan for Wales: Prosperity for All (2019)	Risks to people, communities, buildings and infrastructure from flooding is one of the 4 risks deemed to require urgent action.
Defra 25 Year Environment Plan (2018)	It has a goal to reduce the risk of harm from environmental hazards by: • making sure everyone is able to access the information they need to assess any risks to their lives and livelihoods, health and prosperity • bringing the public, private and third sectors together to work with communities and individuals to reduce the risk of harm • making sure decisions on land use, including development, reflect the level of current and future flood risk • boosting the long-term resilience of homes, businesses and infrastructure
National FCERM Strategy for England	The current FCERM strategy has been updated. It acknowledges that the future is going to be challenging because the climate is changing, with increased risk of stormy weather and rainfall. It includes specific objectives and measures that relate to improving the resilience of communities to flooding and to creating 'climate champions' within communities.
National FCERM Strategy (for Wales)	There is a section on improving community resilience that mentions preparing flood plans and encouraging RMAs to have conversations with communities about how they manage risk and helping them to become more resilient to flooding.
National Infrastructure Commission National Infrastructure Assessment (2018)-	Chapter 5 focuses on reducing the risks from droughts and flooding and makes specific recommendations for building resilience to extreme weather.
Defra and Environment Agency strategies and plans	
Defra's Creating a great place for living (2018) (Defra Group Strategy)	The 8th of 10 goals states: We will lead the response and recovery to floods, other natural hazards and emergencies. We will secure stronger levels of protection from flooding by investing in green and physical infrastructure, and champion approaches which embed resilience in long-term investment decisions.
Defra National Adaptation Programme recommendations (2018)-	Sets out what government, businesses and society are doing to become more climate

UK and national assessments, programmes, Acts and plans	
	ready. It includes recommendations that are likely to affect communities.
Defra-funded Natural Flood Management Programme (2018 to 2021)	£15 million programme that aims to reduce flood and/or coastal erosion risk; improve habitats and increase biodiversity; contribute to R&D by reducing evidence gaps and promote partnership working.
Environment Agency Asset Management Effectiveness Programme	The Environment Agency has a programme to reduce maintenance activities to FCERM assets identified as being no longer economically viable to maintain. It will help to understand the risks associated with transferring maintenance responsibilities to a range of potential local owners.
Environment Agency Asset Management Strategy to 2022	Includes the specific aim that when the Environment Agency engages with communities it will discuss the implications of both active and passive solutions and agree future community participation in the operation and performance of the final scheme.
Environment Agency Flood Incident Management Action Plan and Road Map	Includes actions needed to better inform and prepare communities for flood events.
Shoreline management plan review	SMPs are large-scale assessments of the risks associated with coastal processes. They help reduce these risks to people and the developed, historic and natural environments. These are currently being reviewed.

1.3 Definitions

The following terms are used throughout this report and are defined in this chapter:

- flood and coastal erosion risk management
- communities
- community engagement
- volunteering

1.3.1 Flood and coastal erosion risk management

The term FCERM is defined in the National Flood and Coastal Erosion Risk Management Strategy for England as:

> *"Flood and coastal erosion risk management manages the risks of flooding and coastal erosion to people, property and the natural environment. The work focuses on minimising, predicting and managing the risk and it is one of the primary roles of the Environment Agency."* (Environment Agency 2020, p.59)

FCERM applies to all sources of flooding from rivers, surface water, sewers, reservoirs, estuaries and the sea. The term also includes the process of coastal erosion.

1.3.2 Communities

The term 'community' is hard to define, because a community cannot be satisfactorily defined solely by its location or by its networks. The term can also mean different things to different people.

For the purpose of this project, the term 'community' is made up of 3 elements: 1) spatial, 2) social and 3) cognitive. Communities are made up of groups or networks (social) of people living in particular geographical locations (spatial). These groups have identities and create a sense of belonging or exclusion (cognitive).

Communities are dynamic and have different characteristics that will influence how they become engaged in FCERM. Psychological or cognitive elements play an important part in identifying a community. For example, whether people feel that they belong to a community, share the same views or interests or have a common objective (such as a local flood group).

The research is interested in people who become engaged in FCERM either as part of a group or on their own. As the term 'community' is hard to define, for the purpose of this research it refers to either individual members of the public or to groups. The literature review is simply interested in who is taking part in FCERM activities and how.

1.3.3 Community engagement

The term 'community engagement' is often used by institutions and public bodies to refer to their engagement or involvement with communities. It is not a term that communities tend to use themselves. In some cases, this term has negative connotations because it can refer to poor engagement, where something is done 'to' the community rather than 'with' them.

Good practice community engagement is the development of practices and actions that enable members of the community to influence decisions that affect their lives (adapted from Involve, 2005, p.19). It typically involves:

- recognising the principles of engagement
- understanding the context in which engagement takes place
- having clear objectives
- understanding the communities who are involved/affected
- identifying appropriate methods of communication and engagement
- evaluating and learning from the practice of engagement

Communities Scotland (2005) defines community engagement as:

> *"Developing and sustaining a working relationship between one or more public body and one or more community group, to help them both to understand and act on the needs or issues that the community experiences."* p.4

Engagement includes:

- developing relationships
- having open and clear communication
- networking, listening and having fun

- understanding the diversity of people and places

The main point about the Communities Scotland definition is that it focuses on developing and sustaining relationships rather than on getting specific tasks done. Good practice engagement is relational rather than instrumental. In this report, the term 'community engagement' is used to describe situations when RMAs/public bodies work with communities to develop relationships with local individuals and groups.

The box below provides some of the principles and guidance that come from the Welsh Government, the Environment Agency and the Local Government Association (now the Ministry of Housing, Communities & Local Government) which are helpful in understanding different institutions' approaches to engagement.

Principles and guidance on engagement

The Welsh Government, the Environment Agency and the Local Government Association have all produced principles or guidance on working with communities or members of the public.

National principles for public engagement in Wales

These principles were developed by Participation Cymru and endorsed by the Welsh Government in 2011. They are designed to be used by public service organisations across all sectors in Wales.

Engagement should enable communities to influence policy, service design and delivery from an early stage. The focus is on how external public bodies or other organisations can ensure this happens, by giving everyone the opportunity to be involved, communicating clearly, providing easy to understand information that is tailored to users' needs and respecting the views of all.

The principles recognise that for people to participate effectively, they will need to develop skills, knowledge and confidence. Resources should be available to provide training, guidance and support for both communities and staff.

The emphasis is on gathering views to inform public service organisations' decisions or actions. There is no reference to ongoing collaboration or engagement around community-led initiatives.

Environment Agency 'Working with others: A guide for staff''

The guide was updated in 2016 and is intended for all staff to use: '*The way we work with others is a key part of everyone's role at the Environment Agency*' (p.2).

The *Working with others* approach is intended to help staff understand the concerns, interests and priorities of interested groups, including members of the public. This will help to make sure that the Environment Agency's decisions are widely supported, and provide solutions to the problems they address. Early and effective engagement should result in better environmental outcomes, can save time and money, and enhance the Environment Agency's reputation. The approach is structured around 4 steps or questions about the engagement:

- What do we want to achieve?
- Why work with others?
- Who do we need to work with?
- How do we work with others?

How engagement happens will depend on the answers to these questions. For example, the section on 'Who do we need to work with?' encourages staff to identify all the possible interested groups - '*any individual, group or organisation that believes*

it could be affected by, interested in or could affect or influence the project or issue' (p.19) - and think about them in terms of different categories, for example, sectors, levels of knowledge or understanding of the topic, socio-economic categories. This helps to think about people and their possible relationship to the project or issue.

The last 2 steps are achieving engagement and the evaluation of how well it went and what can be learned from it.

The approach focuses on achieving the Environment Agency's business objectives in a way that increases public support and reduces costs and risks. Engagement should be proportionate: in some cases, the Environment Agency will collaborate with others to implement initiatives jointly. In other situations, it is up to the Environment Agency to take a decision. Here, the proportionate approach may be to tell people what decision has been taken and why (this is known as 'Decide, announce, defend' or DAD) or have a 2-way process of deliberation with interested groups and/or communities (this is known as 'Engage, deliberate, decide' or EDD).

Local Government Association 'New Conversations: LGA guide to engagement'

The LGA guide recognises that local councils have ongoing relationships with residents and that they need to work with communities. The benefits of engagement are described as gaining input to enable the authority to make the right decisions and manage people's expectations:

> *"By grasping what people need and what they can do for themselves, authorities can work better with communities and be more efficient. By bringing people in on decision making, councils can get decisions right, manage expectations and improve relationships with residents*." (p.6)

The guide differentiates between 'engagement' and 'consultation'. Consultation is defined as*:*

> *"The dynamic process of dialogue between individuals or groups, based upon a genuine exchange of views with the objective of influencing decisions, policies or programmes of action…Consultation will also have a clear beginning, middle and end. It might be part of an ongoing, continuous period of engagement, but it is a process. Its remit should be finite and the scope for stakeholder input should be clear."* (p.31)

Engagement is seen as being about developing productive working relationships between communities and public bodies to encourage action on needs or issues the community experiences. It may involve co-production (where the authorities and members of the community do things together) or supporting citizen power (where the authorities step back and local people take the lead (p.32).

The guide suggests that citizens will ideally take more and more responsibility for issues, but that realistically authorities will sometimes need to just give information or consult (p.33).

When deciding what engagement methods to use, the LGA proposes that authorities ask themselves 4 questions. These are based on the Big Lottery Fund's Community Planning Toolkit (Big Lottery, 2014) and are very similar in focus to the Involve principles:

1. What is the objective of the engagement?
2. Who are the interested groups and what are their needs?
3. What stage of the decision-making process are we at?
4. What resources and limitations apply? (p.38)

Community engagement discussed in this chapter has focused on the top-down definitions; those from the RMAs. This shows the extent to which the term has become institutionalised as a formal process. There are many occasions when individuals and groups act to manage their flood risk which is not initiated by RMAs, and occasions when individuals and groups want to engage with RMAs and are not able to do so effectively. This can also be called community engagement. In this report, when the term is used it is largely referring to top-down approaches.

1.3.4 Volunteering

The term 'volunteering' is used in this report. It is defined by the Home Office (2005) as:

> "*An activity that involves spending time, unpaid, doing something that aims to benefit the environment or individuals or groups other than (or in addition to) close relative."* (Home Office, 2005, p.4)

Flood volunteers carry out a wide range of activities (Ambrose-Oji et al, 2015; Twigger-Ross et al, 2015) that can be classified as follows:

- **knowledge focused –** for example, surveying a river in a catchment walkover, checking river gauges, monitoring water quality, pollution monitoring, and collecting data as part of a citizen science project
- **campaign focused** – for example, raising awareness of flooding, taking part in flood planning, educational work with schools, and promoting the uptake of local flood warden services
- **physical focused** – for example, building embankments, managing habitat, opening and closing sea gates, clearing drainage ditches and watercourses
- **virtual focused** – for example, remote monitoring or online work such as documenting the groups' activities and providing information on web pages

In this report, the following definitions describe the different types of participation.

1.3.5 Participation

Alongside the term community engagement there are many other terms used to describe ways in which individuals and groups take part in FCERM activities. Many of them have very specific meanings and can be linked to specific approaches. Participation is defined quite generally as the act or process of participating. For this reason, this term has been used in the research questions. It is intended to be an umbrella term to cover the different ways in which people might be involved in FCERM activities.

1.4 Defining the FCERM activities

This literature review covers 6 different types of FCERM activity that communities are involved in. Defra and the Environment Agency identified these as priorities (see Table 1.2).

Table 1.2 FCERM activities

FCERM activities	What it covers
Managing flood risk assets	Watercourse maintenance, such as making sure ditches and culverts are cleared of obstructions, looking after channels, repairs to bunds and FCERM measures, and monitoring river levels and assets.

FCERM activities	What it covers
Preparing for, responding to and recovering from incidents	• **Preparedness -** issuing flood warning and flood forecasting, developing and implementing local community emergency flood plans • **Response** - using volunteers, using flood stores, flood wardens, setting up rest centres • **Recovery -** supporting communities and individuals through the recovery process
Taking part in decisions, designs and funding for schemes	Communities are involved in both developing and funding FCERM schemes. This includes how communities are engaged in deciding what types of schemes are appropriate to address a specific problem.
Managing land to achieve flood risk benefits	Communities engaged in how land is managed to achieve flood risk benefits such as through natural flood management (NFM), and land management funded through mechanisms such countryside stewardship schemes.
Preparing and adapting homes to reduce flood impacts	Property flood resilience - the measures that communities and individuals can put in place to reduce the impacts of floods.
Taking part in conversations about long-term adaptation	Long-term adaptation, specifically related to coastal erosion and sea level rise. It also includes the development of FCERM strategies such as SMPs and FRMPs.

1.5 Structure of the report

This report is split into the following chapters:

Chapter 1. Introduction – sets the context for the project explaining why its being undertaken.

Chapter 2. Methodology – explains the literature review and gap analysis method.

Chapter 3. Putting the review into a wider context – places this literature review in its wider context.

Chapters 4 to 9. Literature reviews – summarises the review for each of the 6 activities communities are engaged in.

Chapter 10. Similarities and differences in public participation - Looks at the similarities and differences across the 6 FCERM activities.

Chapter 11. Research gaps – summarises the research gaps identified.

Chapter 12. Discussion and next steps.

2 Methodology

To review the literature, the authors consulted the experts in their project team and steering group, interviewed other experts in this field, and carried out a detailed search of the academic literature.

This chapter describes how the review was carried out, focusing on the process, inclusion/criteria, search strings, sources of evidence and overview of the reviewed literature. A lead was appointed for each of the 6 FCERM activities.

2.1 Steps in the literature review

The literature review was developed by Collingwood Environmental Planning (CEP) following 9 steps described in Table 2.1.

Table 2.1 Steps taken in the literature review

Step	Description
Step 1	• Key source expert from the project team chose up to 6 key papers known to them in the area. • Key source expert reviewed papers by filling in spreadsheet with information against each research question.
Step 2	• Key source expert passed the spreadsheet to second person to review.
Step 3	• Second person reviewed the content of spreadsheet and added up to 4 more papers that they were familiar with – if no more were known then it was considered as complete.
Step 4	• Second expert sent the spreadsheet for review.
Step 5	• CEP conducted Scopus (abstract and citation database of peer-reviewed literature) searches for the 6 FCERM activities and added relevant papers to each spreadsheet (section 2.3).
Step 6	• CEP merged expert input with search material and sent out to lead authors for each of the 6 FCERM activities.
Step 7	• Lead authors developed a review for each area under each research question.
Step 8	• Lead authors sent complete reviews to CEP. • CEP pulled together all drafts and short section on engagement and key themes.
Step 9	• CEP conducted interviews with a range of academics and consultants engaged in relevant research. • Lead authors incorporated the key findings from the interviews to support the drafts for each of the 6 FCERM activities covered by this review.

2.2 Research questions

Seven research questions were developed to guide the literature review see Table 2.2. The research questions helped identify the key literature sources and key terms from each question that could be used in the search strings (Appendix A).

Table 2.2 Research questions

Research questions
RQ1: To what extent and in what ways are members of the public participating in the six FCERM activities across all sources of flood and coastal erosion?
RQ1.1: Who is participating in these activities?

Research questions
RQ1.2: How are they participating? *RQ1.3: Why are they participating?* *RQ1.4: How sustained is their participation?* *RQ1.5: What activities are they carrying out?*
RQ2: What are the barriers and facilitators to members of the public participating in the six FCERM activities across all sources of flood and coastal erosion? *RQ 2.1: What are the individual/psychological barriers and facilitators to members of the public participating?* *RQ2.2: What are the social/institutional barriers and facilitators to members of the public participating?* *RQ2.3: What are the material barriers and facilitators to members of the public participating?*
RQ3: What approaches/models of participation encourage/discourage members of the public participating in the six FCERM activities areas across all sources of flood and coastal erosion?
RQ4: What types of governance and institutional arrangements facilitate or inhibit members of the public's participation in the six FCERM activities areas across all sources of flood and coastal erosion?
RQ5: What are the costs and benefits (to communities and RMAs) of members of the public participating in the six FCERM activities areas across all sources of flood and coastal erosion? RQ5.1: *Why do communities and RMAs consider participation of communities in the six FCERM activities areas across all sources of flood and coastal erosion to be important/not important in tackling flood and coastal erosion?*
RQ6: What are the similarities and differences in members of the public participating across the six FCERM activities areas and all sources of flooding and coastal erosion?
RQ7: What are the key gaps in the evidence across the research questions? Which gaps, if filled, would improve members of the public's participation across the six FCERM activities areas and all sources of flooding and coastal erosion?

2.3 Protocol for the e-search

To supplement the initial identification of key literature by 2 experts from the project team (see steps 1 to 4 in Table 2.1), an online e-search for information was carried out. The e-search protocol follows the structure laid out in the Joint Water Environment Group guidance (Collins et al, 2015) together with other issues that needed to be considered (see Appendix A).

In advance of the e-search, its scope was established by defining the inclusion/exclusion criteria for the search strategy (see Appendix A, Table A.1). The key inclusion criteria for literature was to have a UK focus and have been published since 2014. Literature published earlier was included if it was considered to strongly influence later studies or where experts felt that key insights could be drawn from European examples. Research that is not relevant to flooding and doesn't address participation of members of public was not included.

To further specify the search criteria, the project team applied a slightly modified version of the PICO[4] approach. This details which population is to be studied, what intervention

[4] Problem/Patient/Population, Intervention/Indicator, Comparison, Outcome and Time/Type of study

the project team is looking at (for the purposes of this study), what comparators they are interested in and what outcomes they are investigating (see Appendix A Table A.2).

To gather relevant literature, the team carried out a search using various locations (see Appendix A. Table A.3). A key location for peer reviewed literature was Scopus. Different search strings were used in the Scopus search (see Appendix A). Other prominent sources included the results from a literature search request by Environment Agency, Defra and Environment Agency websites among others.

2.4 The literature review

The literature review was carried out in 2 stages:

- categorising and prioritising sources
- reviewing sources for each of the 6 FCERM activities

2.4.1 Categorising and prioritising literature

Through the e-search the project team identified an initial long list of relevant peer-reviewed literature. To identify their relevance to a particular FCERM activity, the team carried out a brief review of the information found in abstracts, after which the literature source was assigned to the most relevant FCERM activities. This enabled the team to shortlist a small number of sources for each FCERM activities to prioritise further (see Table 2.3). Only the most pertinent articles were reviewed in full. To help them do this, the team evaluated each source in relation to the prioritisation criteria:

- the extent to which the source answered each of the main research questions
- the quality of the source – peer reviewed, robust studies
- the methodology used to carry out primary research

2.4.2 Reviewing

All the prioritised papers were logged in an Excel spreadsheet, which drew out information such as:

- author, date, title, journal and abstract
- the type of research (for example, quantitative experimental, quantitative observational, qualitative studies, economic studies, or reviews (for example, Joint Water Environment Group classification))
- sample:
    - empirical articles: sample size and type, for example, members of the public/students, representative or not, geographical location
    - review articles: whether it was a systematic review or not, number of papers, location of research in papers
- method:
    - empirical papers indicate if comparison, type of data collection (questionnaire/interviews/document analysis)
    - review papers type of review: systematic, rapid evidence assessment or literature review

- robustness assessment – for each of the following aspects a robustness score was provided (3 = completely, 2 = partially, 1 = not at all and N/A for not applicable):
    - questions and hypotheses clear and answered?
    - methodology clearly and transparently presented
    - method appropriate to research question and study conclusions
    - geography/context clear and relevance of findings to other context
    - links between existing research, data, analysis and conclusions are clear
    - limitations and quality are discussed
- Relevance to other FCERM activities

Putting this information in a spreadsheet helped collate the evidence.

2.4.3 Overview of literature

A total of 129 articles were identified through this initial literature search, which drew together literature identified in Scopus and an additional literature search carried out internally by the Environment Agency. Literature from other sources, including grey literature was also included following consultation with the project's steering group.

The number of articles per FCERM activity varied. The total number of papers identified at each stage of the review process and the number included in the final review for each technology is summarised in Table 2.3. Some sources were relevant for more than one FCERM activity and therefore were reviewed by the lead author from the perspective of the particular FCERM activity. Therefore, the total number of papers identified across the 6 FCERM activities (152 papers) is greater than the number of articles identified through the literature search as they also include duplicates.

Table 2.3 Summary of final literature reviewed for each FCERM activity

FCERM activity	Total no. of papers identified	Total no. of papers included in review	No. of review papers	No. of empirical papers	No. of other
Managing flood risk assets	20	14	3	7	Book chapters = 1 Mixed – review and empirical = 3
Preparing for, responding to and recovering from incidents	36	20	0	20	0
Taking part in decisions, designs and funding for schemes	20	7	1	6	0
Managing land to achieve flood risk benefits	27	14	2	10	Case study report = 1 Guide = 1

FCERM activity	Total no. of papers identified	Total no. of papers included in review	No. of review papers	No. of empirical papers	No. of other
Preparing and adapting homes to reduce flood impact	26	11	1	10	0
Taking part in conversations about long-term adaptation	23	13	3	10	0
Total[5]	152	79	10	62	7

The robustness of reviewed literature was assessed in order to acknowledge the reliability of each source that support this work (see Appendix B). With an average score of 2.6 across all sources it appears that the literature is fairly robust, considering that a score of 3 would be assigned to a completely robust source. From this exercise, it is evident that the most robust sources are for the following FCERM activities: A - *Communities managing their own flood risk assets* and F - *Communities engage with conversations about long-term adaptation,* with average scores of 2.9 and 2.7 respectively. Notably, very few sources across all FCERM activities received a score below 2 – partially robust – which indicates a reasonably high confidence in the literature reviewed.

Following the literature review, the strength of evidence was also assessed for each FCERM activity across the research questions (see Appendix C). From this exercise, it is evident that for most FCERM activities the reviewed literature across research questions often focused on the same area. For FCERM activities C - *Communities engaged with decision, designs and funding for schemes* and F - *Communities engage with conversations about long-term adaptation* in particular, literature and findings across most research questions was limited. It appears that the research question on barriers and facilitators to participation has the most studies available that build on each other, forming a clear body of work.

2.5 Expert interviews

Expert interviews were also carried out to discover other sources of literature that may have been missed through a desk-based review. Seven experts were interviewed and they provided additional information and references that were used in this review. An additional 3 experts were contacted requesting written answers to the research questions; one expert responded. The information provided is incorporated throughout this report.

2.6 Stakeholder workshop

The stakeholder workshop was held on 11 March 2020 in London as part of the preparation of the FCERM R&D framework. Table 2.4 summarises the main details of the workshop.

Table 2.4 Workshop details

Venue	London, UK: Mary Ward House, 5 - 7 Tavistock Place
Date	11 March 2020

[5] This includes papers that were reviewed that cut across more than one FCERM activity.

Participants	28 participants
Chair	Paula Orr
Facilitators	CEP, Environment Agency and Middlesex University London
Rapporteur	CEP and Middlesex University London

The overall objective of the workshop was to consult and engage a range of key stakeholders (interested groups) in developing the communities and FCERM R&D framework. The workshop was designed so attendees could share knowledge, experience and perspectives. It was organised into 3 breakout sessions, a marketplace session, and 2 plenary sessions. The outline of the workshop was as follows:

- Introduction and overview of project – summary of findings from scoping and literature review
- **Breakout session 1** – participants in groups discuss evidence and research needs related to the following FCERM activities:
    - managing flood risk assets
    - preparing for, responding to and recovering from incidents
    - engaging in conversations about long-term adaptation
- **Breakout session 2** – participants in groups discuss evidence and research needs related to the following FCERM activities:
    - engaging with decisions, designs and funding for schemes
    - managing land to achieve flood risk benefits
    - preparing and changing homes to reduce flood impacts
- **Marketplace** – participants review and add to outputs from breakout group sessions
- **Plenary 1** – Feedback and discussion from breakout sessions 1 and 2
- **Breakout session 3 –** Prioritising gaps – participants discuss and prioritise identified R&D gaps
    - Participants divided into groups based on job role
- **Plenary 2** – Feedback and discussion from prioritising gaps breakout session

More information on the workshop and its outcomes can be found in the Workshop report, which can be requested from the Environment Agency.

3 Putting the review into a wider context

This chapter places the literature review in a wider context, making links to community resilience and related bodies of social science research that cover perception of risk and risk communication; behaviour change, and inequalities and understanding characteristics of communities. Any research projects developed though this R&D framework will need to be grounded in existing social science research which is not confined to FCERM.

3.1 Community resilience

In order to understand the participation of individuals and groups in FCERM it is useful to place that activity within a wider framework of community resilience to flooding. A recent report for Defra (Twigger-Ross et al, 2020) reviewed a number of resilience frameworks, drawing out key characteristics of such an approach:

"*The proposed approach to flood and coastal erosion resilience:*

- *emphasises preparing, planning, protecting, responding, recovering and adapting*
- *clearly differentiates between community and place*
- *unpacks capacities to cover all aspects of systems (for example, social, economic, institutional, infrastructure, community capital and environmental)*
- *acknowledges inherent and emergent resilience*
- *highlights the maintenance of identity and functions of places and communities; is embedded within a wider narrative of thriving and flourishing in spite of floods and coastal erosion*
- *uses the four Rs (redundancy, resourcefulness, rapidity and robustness) to interrogate the quality of capacities/interventions*
- *focuses on a wide portfolio of structural and non-structural measures to achieve its goals." (Twigger-Ross et al, 2020)*

One community resilience framework that has been looked at in some detail in relation to flooding in the UK is that of Cutter et al. (2010). This was drawn on by Twigger-Ross et al (2015) in their evaluation of the flood resilience community Pathfinders project and it has also by the Environment Agency in their community flood resilience project (Environment Agency, 2019b). An important aspect of that framework relates to the capacity that communities have or can develop to increase resilience to flooding. Cutter et al (2010) provide 5 categories of community resilience. These include social, economic, institutional and infrastructure resilience, and community capital. These categories relate to how communities 'engage' with (in other words, prepare for, withstand, respond to, and recover from) disasters, taking the view that: *"Resilience is a set of capacities that can be fostered through interventions and policies, which in turn help build and enhance a community's ability to respond and recover from disasters*." (Cutter et al, 2010 p.2). More detail on the 5 capacities is as follows:

- **social resilience**: based on the current and potential capability of individuals to engage with flooding within a community due to, for example, their mobility, language, health. This category links closely with much of the work that has been

carried out on social vulnerability in the context of flooding. It is possible for a person to be vulnerable to flooding, for example, by having a lack of mobility, yet resilient in the context of a flood because he/she is part of a network of people who can provide necessary help during a flood

- **community capital:** focuses on the existing networks and relationships within the local area. For example, knowing neighbours, informal help given and received and the number of community groups someone belongs to. Evidence suggests that this is the 'glue' that keeps communities together and provides the foundations upon which community flood resilience can be built
- **economic resilience**: refers to the economic vitality of both individuals and the community, including housing capital and ownership, equitable incomes, employment and business sustainability. Evidence shows that having greater financial resources can increase resilience to flooding
- **institutional resilience:** focused on what institutional arrangements and experience are present within the community in relation to flooding. Institutional resilience focuses on the development of institutions, both formal and informal to support improved FCERM. It includes both new institutions (for example, flood group, flood group networks), as well as activities that help to build resilience within and between existing institutions (such as multi-agency meetings, community flood plans and resilience groups within parish councils)
- **infrastructure resilience:** around the resilience of infrastructure in a community, and is taken together with any actions that communities take to increase their resilience to flooding through physical measures, including property-level protection measures, flood storage, highway drainage

Participation in FCERM is a way of increasing a community's resilience capacity, through the work that volunteers might do (for example, developing flood plans, clearing ditches), their knowledge of local flood risk and perhaps, most importantly, through the networks that are developed between both community members themselves and community members and RMAs. Linking future research projects into a framework of resilience will be important so that focus can be placed on efforts to build capacity.

3.2 Related key social science evidence

In this section 3 key areas of research are highlighted because they are connected with the FCERM activities reviewed in this report.

3.2.1 Perception of risk and risk communication

There has been much work carried out on the perception of risk and risk communication starting with Slovic's seminal research in the 1980s (Slovic, 1987). With respect to flooding, the Environment Agency commissioned a flood risk dialogue process (Environment Agency, 2015), which included a review of risk communication literature. What is clear from this body of work is that the risks are perceived through a lens of psychological, social and cultural factors, and that people gather information about risks from a wide range of sources (for example, friends, family, social media as well as from RMAs). It was found that how an individual interprets a risk or a hazard relates to their level of trust in the source(s) of the information. Just providing information is often not enough to lead to changes in behaviours. Many of these themes are discussed in more detail in Park et al (2020) during a review carried out for the Environment Agency in relation to increasing the uptake of property flood resilience (PFR) measures.

In the flood risk dialogue work, the dialogue with members of the public looked at the meaning of messages about flood risk, including the link between understanding the risk

and taking action. The dialogue also covered innovative methods and techniques to help individuals and communities understand their risk of flooding.

The following key principles to consider when developing flood risk communication emerged from the dialogue workshops:

- Think about the needs of different audiences.
- Don't assume a little bit of information will scare people – telling the truth about risk and impacts is more likely to lead to action.
- Stop talking about probability and risk in mathematical language as it means very little to a lot of people.
- Be very clear with people on what is happening before, during and after a flood, and what actions they should take.
- If you are asking people to take individual actions, tell them in the same communication what local/national organisations are doing too – that is, we're all in this together.
- Focus on making information local, with historical context.
- Don't just focus on the negative impacts of flooding – focus on what people can do about it. The workshops also highlighted the difference in awareness and readiness to take action between those who have experienced recent or regular flooding ('flood literate') and those who have not ('flood unaware').' (Environment Agency, 2015, p. 1)

Key findings from that work have been taken into operational activities. What is relevant here, is understanding that individuals' and groups' decisions to participate in a range of FCERM activities will be related to their perception of the risk that they may be facing. Further research into the FCERM activities covered in this review will need to consider this work.

3.2.2 Behaviour change

Behaviour change is another area that is relevant to this literature review. There are a range of behaviour change models that conceptualise what factors influence behaviours and how to facilitate changes in behaviours. For this piece of work, the project team has drawn on Darnton and Horne's (2013) ISM (Individual, Social, Material) model in examining the barriers and facilitators to people participating in the range of FCERM activities.

Given that different disciplines and perspectives have contributed to understanding FCERM behaviours, it was felt that the ISM model offered a valuable multi-disciplinary framework spanning 3 schools of behavioural theory (social psychology, sociology and behavioural economics). The model does not seek to predict behavioural responses, but to account for factors identified as influencing behaviours at different levels. The value of this model is that it recognises the multiple levels at which people operate - as individuals, as part of or in relation to social groups and wider society and within wider technological, regulatory and material systems, including the basic conventions that give order to everyday life. The model suggests that lasting change requires action at all 3 levels. Figure 3.1 shows the 3 levels of the model.

This view of behaviour change is similar to work looking at why people participate and stay involved with a range of activities (Involve, 2011). Involve (2011) found that:

"*Participation is shaped by a multitude of factors that shift in significance over time and are in turn shaped by the impact of participation itself. These factors operate at different levels:*

- individual, including motivations, personality, identity and resources

- relationships and social networks, including an individual's family, friends, neighbours, colleagues and wider social networks
- groups and organisations through which people participate, including their structures, processes and culture
- local environment and place, including local spaces, events, institutions and politics
- wider societal and global influences" (Involve, 2011, p. 35)

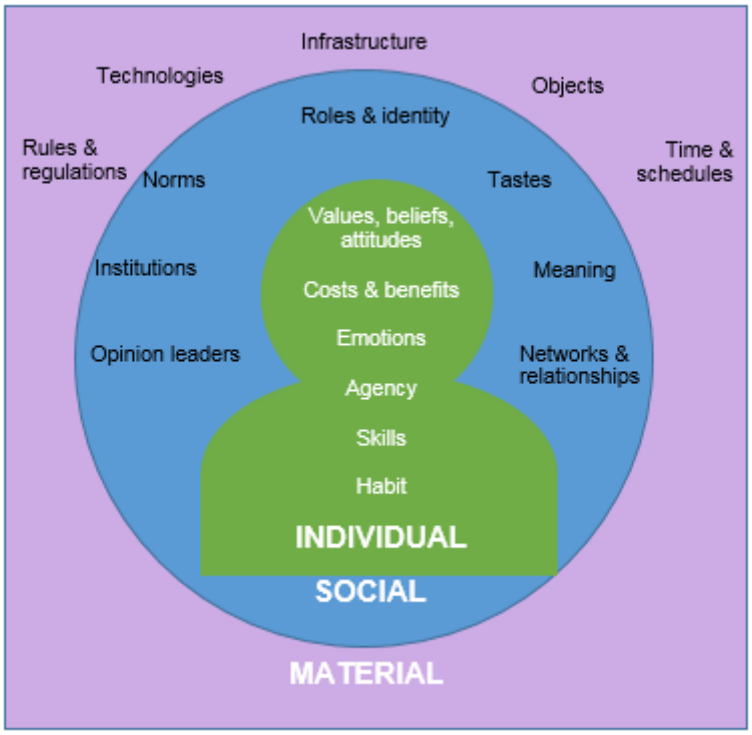

Figure 3.1 Individual, Social, Material model (Source: adapted from Darnton and Horne, 2013)

The Environment Agency has commissioned a project using a behavioural insights approach with respect to the uptake of PFR (Park et al, 2020). This includes a very useful broader review of a range of factors from a behavioural science perspective and is focused largely on the individual/social level. From the disciplines of behavioural economics, cognitive and social psychology, the authors suggest a number of key conclusions:

"Principally, these fields of study reveal the importance of non-conscious as well as conscious factors in our decision making. The former includes the profound influences of emotions, intuition, heuristics (mental shortcuts or rules of thumb) and cognitive biases (predictable deviations from pure economic 'rationality' in our decisions). This body of work also highlights several psychological barriers to taking action. These include procrastination and hassle, a tendency to discount uncertain events in the future relative to the upfront costs of taking action, a tendency to deny and avoid discomforting information about risk, and low self-efficacy (that we can do something worthwhile) or low responsibility (that we should be expected to). This research also sheds light on how we are influenced by our environment. This includes our social environment – we adopt the norms of our peers and form beliefs in line with our cultures and social identities. It also includes our physical environment, as we tend to go with what is easy, available and salient." (Park et al, 2020, p. 8)

The research into behaviour change focuses predominantly on change to individual behaviours, whereas work on participation focuses on volunteering and participation in a range of voluntary activities. Both are key sources of information for all of the FCERM activities and should be drawn on for future project proposals.

3.2.3 Inequalities and understanding the characteristics of communities

A final key area of relevance relates to understanding the characteristics of communities, specifically vulnerability and environmental inequalities. This is relevant because enabling individual and group participation in FCERM will be different depending on the nature of the community. Areas that are vulnerable not only to flooding but also socially vulnerable need to be heard more within the FCERM decision making processes but are least likely to be engaged in those processes. A further objective of participation in FCERM is for all voices to be included in decision making. Ensuring that there is representation from all types of affected communities is vital if FCERM decision making is to be fair and help to address inequalities rather than potentially reproducing them. Furthermore, engaging individuals and groups from the perspective of RMAs is likely to be easier in areas where there is greater affluence, access to services and lower levels of social vulnerability. The tendency could be for those types of areas to have a greater voice in decision making than those who are most in need of support to build their resilience to flooding.

There is a clear body of work around FCERM, vulnerability and inequalities in the UK, with key research having been commissioned by the Environment Agency (for example, Tapsell et al, 2002; Fielding and Burningham, 2005; Walker et al, 2006; Walker and Burningham, 2011) and the Joseph Rowntree Foundation (Lindley et al, 2011; Sayers et al, 2017). These pieces of research looked at the distribution of flood risk and how it related to social deprivation. They also explored which social groups were more vulnerable to flooding and to the negative impacts of flooding. These included, for example, people with English as their second language, people living in bungalows and people with pre-existing health issues. Walker and Burningham (2011) concluded that there is evidence of significant inequalities and grounds on which claims of injustice might be made, but that further work was needed to investigate these. Sayers et al (2017) developed an index for assessing flood vulnerability and disadvantage across the UK. This is an invaluable source of information as context for participation in FCERM activities and should be drawn upon in future research projects. Understanding participation rates in relation to levels of flood vulnerability and disadvantage would be a useful mapping exercise for RMAs.

4 Managing flood risk assets

Key findings:

Across England and Wales there is evidence that local groups have been set up within communities to manage FCERM assets, with volunteers participating in a range of asset management activities.

Managing flood risk assets involves complex roles and relationships. The workshop participants noted that RMAs have different definitions of assets. While some good case study analysis is available, additional evidence is needed about how different types of local communities are linked in with asset management organisations and the asset management cycle. There is a need for more systematic information on the number of groups involved in managing assets, how long they have been performing this role and their roles and relationships with RMAs.

Community-led activities to manage FCERM assets need to be carried out in a co-ordinated way alongside relevant RMAs. Relationships with flood risk authorities enable flood volunteers to increase their knowledge and understanding.

Members of groups managing local flood assets put in their time and sometimes money which is not always reimbursed. There are also costs for RMAs in coordinating or managing this input. Some volunteers feel that the important role they play is sometimes not recognised.

4.1 Introduction

This chapter focuses on engagement activities related to watercourse maintenance (such as making sure ditches and culverts are cleared of obstructions and looking after channels), repairs to bunds, monitoring river levels and operating flood gates.

This chapter looks at how RMAs engage with communities and individuals who manage FCERM assets, and how engagement activities can help improve local asset management.

Overview of the literature

The project team reviewed 14 key publications, which included 10 qualitative studies, 3 mixed methods studies and 1 quantitative study (survey). Four of the documents presented the findings from one research project (Obrien et al, 2014 and 2015).

Four of the qualitative studies also included reviews. Five of the studies provided quantitative data. One of the studies included a simple economic study of benefits and costs of direct action.

Most of these publications explored different experiences of community level action, including:

- community direct action self-help (DASH) groups

- environmental stewardship groups
- co-management groups responsible for nature-based flood management solutions

The rest of this chapter looks in detail at each of the research questions and the extent to which these publications help to answer them.

4.2 Extent and type of public participation

This section summarises the literature that was reviewed to answer the following research question:

RQ1. To what extent and in what ways are members of the public participating in managing their own assets?

The publications reviewed describe a wide range of different activities. Members of the public manage FCERM assets within their community, generally as part of a group or project. The ways that communities participate in FCERM asset management activities include:

- members of the public who live in or near a place where flooding occurs, participating through a direct-action self-help (DASH) group, carrying out physical activities such as clearing streams or repairing FCERM measures in coordination with or facilitated by the Environment Agency (Simm, 2015)
- local communities, landowners, land managers participating in a strategic group as part of a NFM project. Their activities involve sharing knowledge, site visits, meetings and practical activities (Short et al, 2019)
- local flood groups working with local councils to develop initiatives to avoid drains and channels becoming blocked, leading to flooding. Groups in Cornwall, Liverpool and Warwickshire organised to take action to manage local flood assets as part of the Defra Flood Resilience Pathfinder project (Twigger-Ross et al, 2015; Warwickshire County Council, 2015)

Most of these examples involved relatively small groups of people living close to the assets that they manage. Simm (2015) identified 17 DASH groups that were set up across England following severe flooding in 2007. Participants at the project workshop in March 2020 felt that it would be useful to have more evidence about the scale at which communities get involved in asset management and the consequences of working at different scales. RMAs often manage assets at a catchment scale, but this seems to be too large a scale for community involvement.

As part of the Defra Pathfinder[6], Warwickshire County Council supported the creation of flood action groups and actively worked with them. Seven of the flood action groups secured funding for equipment to monitor or maintain assets, including:

- gauge boards for residents to monitor the river watercourse levels
- equipment such as wheelbarrows, spades and brooms so that the community could clear out watercourses

[6] Defra funded 13 Flood Resilience Community Pathfinder projects between 2013 and 2015 to enable and stimulate communities at significant or greater risk of flooding to work with key partners, including local councils, to develop innovative local solutions that improve FCERM and preparedness and improve the community's financial resilience in relation to flooding.

- CCTV to allow community members to monitor the watercourse and take prompt action, lowering the risk of blockage and flooding
- surface water pump to decrease the risk of surface water flooding (Warwickshire County Council, 2015)

Using the types of volunteering described in section 1.3.4, drawing on information from a survey of 63 flood volunteers and examining information from 97 projects, Ambrose-Oji et al (2015) describe the following areas of volunteering as relevant to managing assets (the number of examples of each is shown in brackets):

- **knowledge-focused:** for example, catchment walkover (1); catchment management (3) monitoring (2)
- **physical-focused:** for example, habitat management (11); coastal flood wardens, including opening and closing sea gates (4); lock keeper (2)

Other general categories of volunteering activities such as flood wardens (29), flood volunteers (21) and flood alleviation (11) are also likely to include asset management activities.

A study of flood groups in Calderdale (Yorkshire) found that 'time' is an important factor in understanding the work of most flood groups, as their focus will generally change over time, with the most intense engagement in planning and management of assets in the period immediately after a flood event:

> "[Volunteer] *contributions were dynamic over time, with a strong initial response that diminished over time due to apathy, 'active forgetting' and lack of further exposure*." (Forrest et al, 2018, p.1).

'Active forgetting' is a concept developed by McEwen et al (2017) to describe the process by which many people affected by flooding try to put the experience behind them by actively avoiding the subject and, if probed, saying that it will not happen again.

Soetanto et al (2017) argue that perception of social responsibility is an important factor influencing individuals' willingness to undertake resilient behaviours. A similar concept of community solidarity is mentioned by Carr (2002). Carr details the factors that motivate people to get involved in environmental stewardship groups as: concern with a problem; sense of community; sense of interest; power of the group; altruism; learning information/skills (Carr, 2002). A 'sense of stewardship of place' was also identified as a factor motivating participation in DASH groups. Another factor was the desire to 'do something' to physically mitigate the local flood risk, given low levels of public funding (Simm, 2015). Groups involved in managing assets in the context of NFM initiatives are also motivated by interests in enhancing biodiversity (Short et al, 2019).

The evolution of groups has been widely studied, with Tuckman (1965) and Tuckman and Jensen (1975) describing the classic model of 'forming - storming norming - performing - adjourning'. Groups that successfully manage flood assets will need to continue at the 'performing' stage for as long as the asset(s) exists. Carr (2002) notes that for environmental stewardship groups, at some point after the initial projects and functions are complete, the group moves either to extinction or expansion. One of the 3 groups examined in detail by Carr (2002) declined in membership resources and energy before disbanding. Another expanded its organisational structure and range of activities (Carr, 2002). In the case of communities involved in developing NFM assets, once installed, the assets may only require occasional checks and there may not be the same need for an active group structure (Short et al, 2019).

A main challenge for groups is to sustain momentum through periods of change. Puttnam and Feldstein (2003) found that key to achieving this is:

- developing multiple grassroots leaders with a degree of autonomy
- creating neighbourhood governance structures that support the self-help activity

Sustaining momentum is critical for managing assets which need regular interventions by the group. Simm (2015) found that DASH groups sometimes had to carry out stream clearance activities every month in order for these to be effective.

Warwickshire County Council's Pathfinder project (Warwickshire County Council, 2015) found that groups involved in managing community assets also carry out knowledge-focused activities such as:

- monitoring watercourses
- checking on equipment
- physical activities such as clearing drainage ditches
- building dams and habitat management
- virtual activities, such as remote monitoring of watercourses using CCTV trash screen monitors

The type of work groups carry out depends on the skills and competencies of its members. Many of the participants in DASH groups had some engineering background and understood how water systems work so did not have to rely on external advice or support to do watercourse monitoring tasks. If the tasks require specialised skills or training, community members may not be able to act on their own or may make bad decisions because they have little understanding of technical principles. For example, the proportion of cement one DASH group used in concrete bag work when repairing a dilapidated sea wall was too low. This meant that the concrete in the structure deteriorated much faster than expected and the wall suffered significant damages during the 2014 to 2015 flooding (Simm, 2015).

Forrest et al (2018) point out that where communities lack the capacities required (for example, skills, experience, and physical capacity) civil society groups will be less likely or able to get involved in managing flood assets and:

> *"areas with lower levels of social capital and less active citizens may struggle to replicate the contributions highlighted [in Calderdale]. Putting increased emphasis on 'community flood resilience' in these areas could lead to the creation of inequalities within flood resilience practice, with more active/affluent people and areas receiving more attention, as they have a strong civil society and social bonds, and becoming more flood resilient, while other local people and areas are forgotten."* (p.433)

4.3 Barriers and facilitators

This section summarises the literature that was reviewed to answer the following research question:

RQ2. What are the barriers and facilitators to members of the public participating in managing local assets across?

The survey of flood volunteers carried out as part of a project commissioned by the Environment Agency (see section 4.3) found that the main motivations for volunteering mentioned by respondents were:

- taking action to prevent flooding (40%)

- taking on a leadership role in a community's response to flooding (21%)
- helping the local community (17.5%)

The research project looked at 4 case examples and carried out interviews with volunteers. These highlighted further motivations, including the desire to care for the place people lived in and the desire to protect lives and property (O'Brien et al, 2014). The research identified the lack of clarity about the roles of volunteers, lack of training, lack of evaluation and monitoring and a lack of recognition of the role of volunteers as factors that prevented or made it harder for people to get involved (O'Brien et al, 2014).

Soetanto et al (2017) found that ethics and a notion of personal responsibility are important factors in motivating people to become involved in FCERM activities. Soetanto et al (2017) cite studies that show the ways in which experience of a disaster can influence individuals' engagement:

- motivation to cope with future risks (Siegrist and Gutscher 2008; Siegel et al 2003)
- perceptions of their ability enhance their own resilience to future risks
- level of preparation for future disaster (Sattler et al 2000)
- likelihood of engaging with the issue and creating coping strategies (Spence et al 2011; Fillmore et al 2008; Work et al 1999; Lave and Lave 1991)

Flooding itself, and solidarity with those who have been affected, is recognised as a factor that encourages people to get involved in action (Simm, 2015; Soetanto et al, 2017, based on a survey of 414 people). People are also motivated by a sense of environmental stewardship and through inspirational leaders (Simm, 2015). Soetanto et al (2017) found that older people tend to be more aware of environmental issues (Wells et al, 2011, cited by Soetanto et al, 2017).

Carr (2002) identified personal factors that encourage or enable individuals to get involved in environmental stewardship actions:

- meeting and working locally
- the individual having time available for a worthwhile project
- considerations based on personal priorities like knowing, liking and fitting in with the group
- getting satisfaction from achieving results
- an assessment of the nature of the group (for example, does it have identified goals and does it have funding?)

Carr (2002) also found barriers that may stop people from taking action such as:

- the need to take time off work
- family commitments
- distance from meeting places
- lack of money for travel
- lack of special knowledge or skills
- being tired of going to meetings

Several authors discuss factors related to the way that local individuals and groups relate to authorities. For Simm (2015), it is important that the action group is recognised and accepted by local democratic institutions (for example, the parish council) for it to be sustainable. Short et al (2019) found that relationships with RMAs lead to growing awareness and an increase in local people's knowledge and understanding of how institutions work. This increases people's ability to engage effectively with these authorities. One report noted that the authority responsible for FCERM had to change its approach in order to improve its relationships with local individuals and groups. Warwickshire County Council changed its relationship with flood groups by recognising their capacity and accepting that they could play an important role.

> *"In the past, we would have tried to do everything ourselves but we are more mature and confident now." (Warwickshire Pathfinder Project Manager - personal communication, 2017).*

Twigger-Ross et al (2015) identified the lack of economic and material resources (such as equipment) and time as key barriers to engagement in managing flood assets for all types of community-led organisations. Simm (2015), Carr (2020) and Puttnam and Feldstein (2003) saw the government providing cash and support as important facilitators. Simm (2015) and Soetanto et al (2017) found that reduced public funding can act as a spur to local community activity, as individuals and groups become aware that there are no other resources for addressing the risks they face.

Participants in the stakeholder workshop noted that there are greater risks in managing assets in certain places such as on the coast or estuaries, and these can make community involvement more difficult.

Environment Agency staff who contributed to research on volunteering identified a lack of funding as a limitation on being able to involve volunteers. However, Environment Agency managers participating in the same research did not consider that there was a lack of funding to support volunteering activities (Ambrose-Oji et al, 2015).

4.4 Approaches and models

This section summarises the literature that was reviewed to answer the following research question:

RQ3. What approaches/models of participation encourage/discourage members of the public participating in managing their own assets?

Based on their evaluation of the 13 Defra Pathfinders schemes, Twigger-Ross et al (2015) concluded that "*A community-led or combined (community and institution-led) approach was found to be the most effective approach to community engagement and may lead to flood resilience in the long term*." (p.57). This is not to suggest that the form of community organisation will be the same everywhere. They also stated that "*It should not be assumed that all communities are equally equipped to act, that any costs and benefits of Pathfinder project interventions will be evenly distributed and that they will have addressed social inequity*." (Twigger-Ross et al, 2015). The authors emphasise that communities vary greatly and have different capacities (strengths and weaknesses) that will influence what is feasible and what aspects need to be developed and strengthened. (Twigger-Ross et al, 2015, p.58-59). A similar finding was reported by Forrest et al (2019).

In engaging with groups about managing their own FCERM assets, RMAs need to think about the specific objectives of involving members of the community and about the characteristics of the groups to be involved. The Pathfinder project evaluation (Twigger-Ross et al, 2015) found examples of people and communities being involved in different ways, such as:

- a single person who regularly walked along the local watercourse to identify any problems in the water flow and report them to the wider flood group
- flood wardens who developed and tested their own community flood plans, provided training and equipment for group members and communicated with local people through social media

When communities are involved in constructing NFM measures, it is essential that there are mechanisms and structures that allow local people to contribute their knowledge and expertise: "*The involvement of local community flood forums in narration of recent rainfall events, and increasing the awareness of how water behaves in a catchment and the role of nature-based solutions as a flood mitigation method, is indispensable*." (Short et al, 2019, p.250).

Another important consideration for RMAs is how groups set up to manage FCERM assets can be linked to the wider flood management system, so that they can exchange information, learn from and contribute to the work of other partners. Terms like 'two-way communication' (Soetanto et al, 2017) and 'dialogue with local communities, landowners, land managers and risk management officers' (Short et al, 2019) reflect this priority. Being connected with other partners in the flood management system enables individuals to clarify what they are expected to do by themselves and what can be supported by others (Soetanto et al, 2017).

4.5 Governance and institutional arrangements

This section summarises the literature that was reviewed to answer the following research question:

RQ4. What types of governance and institutional arrangements facilitate or inhibit members of the public's participation in managing assets?

O'Brien et al (2014) identified 4 models for working with FCERM volunteers. However, the authors noted that they found it difficult to describe any example of flood volunteering where relations between the flood group and the Environment Agency exactly reflect any one of the models identified. This is partly because there has been a shift in ways of working, away from the Environment Agency acting on its own and towards greater multi-agency partnership working (O'Brien et al, 2014).

In a survey of flood volunteers O'Brien et al (2015) found that 63% of respondents lived in rural areas[7]. Simm (2015) noted that DASH groups are more likely to be set up in rural locations by one or more motivated people taking the lead, with a mandate or constitution linked to a local institution (such as the parish council) or organisation (for example, tenants' association). Simm (2015) describes the institutional arrangements associated with these groups (see Figure 4.1). Once a group has obtained authorisation from the local parish or town council, it operates fairly independently, getting information about the asset and permissions and advice from the relevant FCERM authority, negotiating with landowners about access to the asset, organising the necessary volunteers and materials and carrying out the works. Simm (2015) noted that DASH groups must navigate their way *"between the constraints of both the physical change taking place in the wider natural and human-made environment and the wider policies, plans and activities. Such alignment is important to avoid wasted work by the group and adverse impact on others."* (p.3)

[7] The authors noted that the survey respondents were not necessarily representative of all flood volunteers.

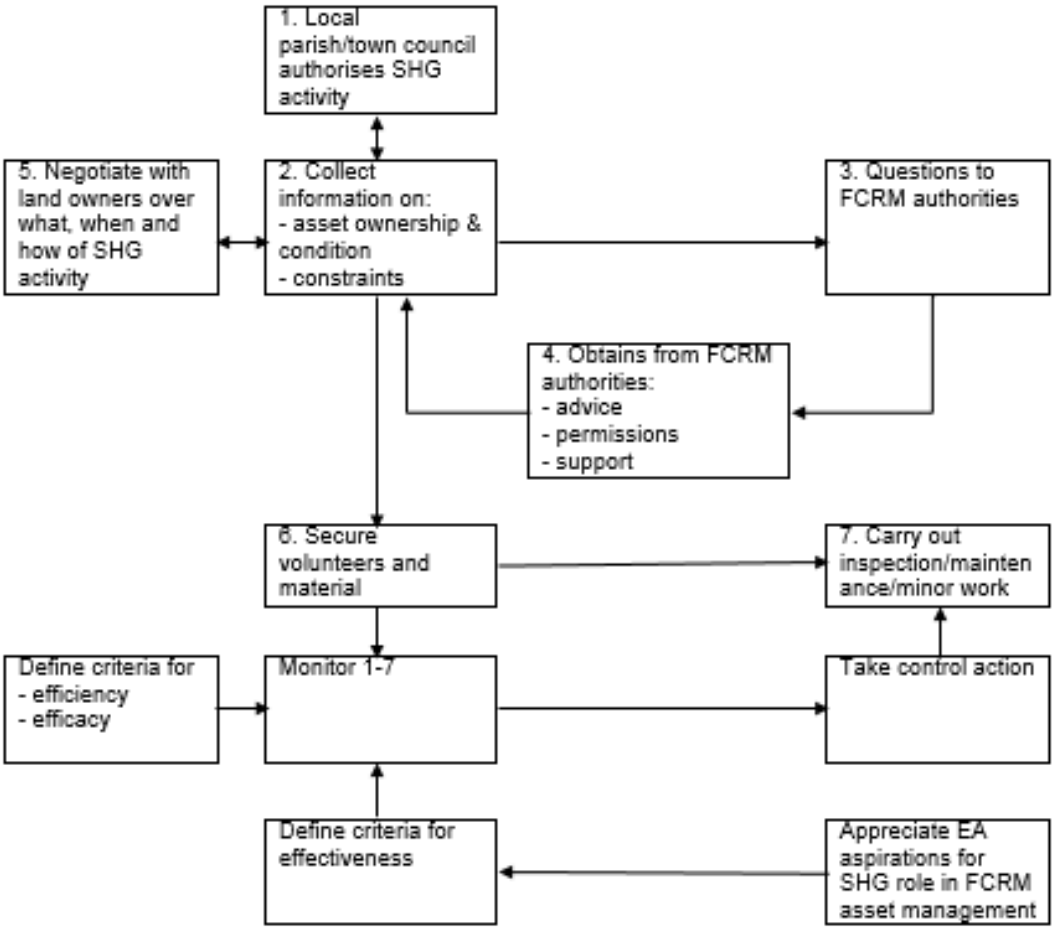

Figure 4.1 DASH group activity sequence (Source: adapted from Simm, 2015)

The relationship between DASH groups and RMAs is extremely important in providing access to advice and information (for example, getting environmental permits and facilitating learning from the work of other DASH groups). This can be provided more effectively by having a single point of contact within an RMA rather than groups having to find the right member of staff (Simm, 2015).

Another example of institutional arrangements for flood groups is the community involvement in NFM work in Stroud, Gloucestershire (Short et al, 2019). Stroud District Council set up a three-year partnership project (the Stroud Frome project) facilitated by a full-time Project Officer (Short et al, 2019). The governance arrangements consisted of a strategic group chaired by an elected member of Stroud District Council, which included members of the local community flood action groups as well as representatives from RMAs, other local interested groups, Natural England and national NGOs. This structure meant environmental NGOs and landowners could carry out focused work, demonstrating and promoting the successes of this approach through dialogue with a wider landowning community. The project now has an extensive network of supportive landowners either already undertaking or planning to implement measures on their own land (Short et al, 2019).

4.6 Costs and benefits

This section summarises the literature that was reviewed to answer the following research question:

RQ5. What are the costs and benefits (to communities and RMAs) of members of the public participating in managing flood assets?

There are a range of benefits that can be achieved by involving people and groups in managing their own flood assets such as:

- cost savings to the RMA when an asset is managed by a community whose members contribute their time for free. Simm (2015) points out that to be effective, the efforts of volunteers need to be closely aligned with and supported by RMAs, and that this has a cost for those authorities. Nevertheless, based on case study analysis, Simm (2015) considers that involving volunteers in asset management provides a higher benefit to cost ratio
- improved functioning of assets. As well as maintenance work, local volunteers may be able to recognise when the asset isn't functioning normally and to inform those who might be affected
- self-empowering community groups (Short et al, 2019; Soetano et al, 2017; Twigger-Ross et al, 2015)
- less passing of responsibilities to other parties (for example, local governments and agencies) (Soetano et al, 2017)

There are also costs associated with involving communities in managing FCERM assets:

> *"For community engagement to be effective, it is important to recognise that community volunteers' time is not unlimited; volunteering is not free, indeed it requires a great deal of financial and human investment…"* (Twigger-Ross et al, 2015, p.62)

However, only limited work has been done to assess and quantify the costs and benefits identified (Ambrose-Oji et al, 2015).

> *"Information* [on costs and benefits of volunteers managing FCERM assets] *is largely qualitative, anecdotal or inferred. There is very little measurement of outputs (for example, kilometres of waterway cleared, metres of ditch dug, and number of gates manned) and no real consideration of outcomes such as the number of households protected and flood incidents averted.*" (p.14)

Data from the survey of flood volunteers and case studies (Ambrose-Oji et al, 2015) indicate that volunteers are clearly adding value in terms of building community resilience and preparedness. This, in turn, is expected to help make communities more self-reliant (O'Brien et al, 2014). As well as operating FCERM assets, local volunteers provide essential local knowledge concerning flood risks and links to local networks.

O'Brien et al (2014) note that decisions about the allocation of resources to FCERM volunteering are made on the basis of cost-benefit analyses, which often fail to capture intangible, indirect and unseen benefits of FCERM volunteering. The authors suggest that the scope of economic analyses may need to be broadened to take account of these benefits, and that those advocating the involvement of volunteers need to present the evidence for this more effectively. If evaluating benefits is seen as an expensive exercise, involving, for example, flood modelling, this could be a deterrent, but a simpler solution has been tested with good results as part of the evaluation of Defra's Flood Resilience Community Pathfinders (Twigger-Ross et al, 2015).

4.7 Conclusions and evidence gaps

There are some studies that look at the wide range of different activities carried out by members of the public in managing FCERM assets within their communities. However, these studies tend to be patchy, covering only certain parts of the country, types of organisation or assets. Systematic information is needed about the activities that groups managing assets are involved in across the country and how they work. This could usefully build on O'Brien et al's (2014 and 2105) research into volunteering, for example, by using or developing the definitions and typology from that research.

The literature reviewed provides some evidence of the factors that facilitate or act as barriers to community engagement in asset management. The lack of a solid foundation of evidence on the ways in which individuals and communities across England and Wales are engaged in a range of asset management activities and the organisations with which they work means that there is an incomplete picture of this area of engagement. Much of the evidence focuses on motivations for engagement rather than practical barriers or facilitators. There is also limited understanding of the knowledge and training needs of communities managing their own flood assets and what approaches to learning are most effective in different contexts.

Workshop participants suggested that a better description is needed of what asset management involves and how RMAs can support community involvement. For people directly involved in asset management, practical guidance on asset maintenance would be useful, perhaps similar to the handbooks published by BTCV (see for example, Brooks and Agate, 2001).

Several of the studies reviewed looked at the governance arrangements for communities managing flood assets. The limited nature of the evidence on the activities carried out and the way the work is organised meant that descriptions of governance arrangements were also incomplete. More systematic evidence on governance arrangements would make it possible to develop and implement the range of activities required to support community involvement in managing FCERM assets.

There is a specific need for research on the relationship between communities and farmers with respect to managing flood assets located on private land. Farmers or landowners may wish to take responsibility for managing assets on their land, but there are no models of how they could work with communities or even with the RMA on this. This gap could be filled by developing a typology of farmer-community relationships and criteria for assessing the outcomes of different types of relationship in terms of locally managing FCERM assets.

The types of evidence that would help to fill these gaps include case studies, evaluations of the work done by community groups to manage flood assets, and analysis of the costs and benefits of this work to RMAs and communities.

5 Preparing for, responding to and recovering from incidents

Key findings:

Community engagement takes place within the context of a general decline in general public engagement in local councils and community ownership (Interview with expert no.1), but a legacy of flood action groups and frequency and severity of flooding acts to promote participation.

Every community poses a different engagement challenge requiring, to a degree, a customised approach.

Members of the public sometimes act collectively in preparing for and recovering from an incident where the flood risk is more than minor and where there has been a recent damaging flood. They are less likely to engage unless the flood risk directly affects them and they already have interests and skills that come from participating in other areas of community life.

When building a partnership between an RMA and public flood groups, introducing and using a trusted intermediary agent is likely to lead to greater success.

Relatively strong individual/psychological barriers exist and need to be overcome to encourage participation.

Substantial social/institutional barriers to participation also exist but a considerable amount is now known about how to overcome these barriers. In particular, the kinds of approaches that can encourage participation are generally well articulated and, in some cases, well-tried (except in deprived communities). Models of governance which are likely to lead to successful participation are now well recognised.

Finding ways and methods of successfully engaging deprived communities that may appear difficult to reach needs further investigation.

Businesses may take up short-term preparatory measures, but examples of them working collectively appear to be relatively rare.

The costs and benefits of community engagement are well articulated but, at the moment, the benefits are probably not as well understood as they should be.

There is a gap in knowledge and evidence about the recovery process.

5.1 Introduction

This chapter is focused on flood incident management activities such as:

- **preparedness -** issuing flood warning and flood forecasting, developing and implementing local community emergency flood plans
- **response** - use of volunteers, use of flood stores, flood wardens, setting up rest centres
- **recovery -** supporting communities and individuals through the recovery process

This chapter focuses on collective participation in which members of the public work together. It looks at:

- how, why and for how long communities participate
- the activities in which they participate
- the factors that facilitate or hinder their participation
- models of participation and governance that are either encouraging or inhibiting
- costs and benefits of participation (to communities and to risk management agencies)
- why participation is considered to be important
- evidence gaps

Overview of the literature

This chapter focuses on 11 key research papers and 9 research reports that include empirical evidence. The findings are also based on one expert interview (expert no.1) and responses provided at a project workshop. The evidence in these papers comes from France, the Netherlands, Italy and the UK.

The evidence presented here mainly comes from a small number of UK case studies, which include mainly qualitative semi-structured interviews, so the results presented here are indicative rather than representative. The following studies are the exception to this:

- Dittrich et al (2016) who surveyed 124 households
- Greaves and Penning-Rowsell (2015) who studied a large number flood action groups in England and Wales
- the Flood Resilience Community Pathfinder project (Twigger-Ross et al, 2015) that collected evidence from 13 case studies, involving over 60 communities and several thousand properties across England
- Communities Prepared (Pilot) Evaluation, in which 272 volunteers from 30 communities were involved (Orr and Johnson, 2018)
- O'Brien et al (2015) in their investigation of the impact of volunteering on resilience carried out a survey with a sample of 63 volunteers and across 4 case studies

5.2 Extent and type of public participation

This section summarises the literature that was reviewed to answer the following research question:

RQ1. To what extent and in what ways are members of the public participating in preparing for incident management?

Evidence shows that members of the public sometimes volunteer and act together in groups to help to prepare for and recover from flood incidents in locations where the flood risk is either more than minor or where there has been a recent damaging flood. The types of groups formed or involved in these activities include:

- flood action groups
- flood warden groups
- community associations
- public Facebook groups
- local residents' groups
- environmental groups

From the literature reviewed for this chapter there was less evidence of businesses being involved in similar activities. However, Johnson and McGuinness (2016) found examples of businesses working together taking a collective approach.

There are numerous ways in which community groups participate such as:

- encouraging flood and flood warning awareness
- moving at-risk household assets
- erecting temporary flood barriers
- acting as first responders
- assisting the emergency services
- training in order to participate effectively and safely
- taking part in consultation meetings about flood recovery
- peer-to-peer learning, where flooded communities pass on their experiences to non-flooded communities so that they are better prepared
- putting pressure on the RMAs to take action

In the Upper Calder Valley (West Yorkshire) local residents, flood wardens, community associations and others joined together to create 'flood hubs' to develop emergency flood plans and to set about flood recovery (Forrest et al, 2018). The 'flood hub' concept has also been developed in Cumbria.

In Sheffield, Johnson and McGuinness (2016) found that owners of small and medium size enterprises (SMEs) formed a Business Improvement District (BID) in partnership with the local authority to help develop and fund a FCERM scheme.

In the Flood Resilience Community Pathfinder project (Twigger-Ross et al (2015)) identified a variety of ways in which community members become involved in flood preparations, including:

- producing e-learning packages and information in different languages

- working with insurers to reduce premiums

At a household level, it was also found that people take precautionary flood reduction measures and 'project manage' their own recovery. Dittrich et al (2016) found that a flood action group in the UK had had a positive impact on individual householders and had encouraged them to take out flood insurance and install flood gates.

The literature did also show however, that voluntary flood groups who are involved in preparing for and recovering from flood incidents tend to decline quite rapidly over time as apathy sets in or as the authorities take action to reduce the flood risk (Greaves and Penning-Rowsell, 2015).

5.3 Barriers and facilitators

This section summarises the literature that was reviewed to answer the following research question:

RQ2. What are the barriers and facilitators to members of the public participating in preparing for flood incident recovery?

The literature for this research question was found to be quite extensive and, as such, is summarised in 3 sub-sections which cover the following barriers and facilitators:

- individual/psychological
- social and institutional
- material barriers

5.3.1 Individual/psychological barriers and facilitators

Barriers can change and become facilitators once they have been addressed.

Forrest et al (2018) found that the main barriers were the 'belief that someone else will sort it out' or that there is either a low level or no level of personal responsibility for helping to manage FCERM, leading to a reliance on publicly-provided flood protection. Where the level of personal responsibility is high, this may encourage people to participate. Anxiety or fear about flooding may, in some cases, lead to it being ignored in what is termed 'active forgetting' (or denial), which removes or lessens the anxiety (Forrest et al, 2018 and Dittrich et al, 2016). Individuals are likely to participate when their personal sense of security is threatened by high levels of uncertainty (Harries, 2008).

The degree of perceived risk or threat and its perceived severity, together with perceived efficacy and cost of engagement and response, may well influence people's willingness to participate. So, if someone's ability to cope is high (in other words, they believe that they can act to reduce the risk and that it is easy to do so), then they are more likely to participate than if it is low (Poussin et al, 2014). There is a complex relationship between perception of risk and willingness to participate in flood preparations because some may perceive that such participation will reduce the degree to which the authorities will take action to reduce the flood risk (Poussin et al, 2014).

The level of flood experience may also influence participation (Bhattacharya-Mis and Lamond, 2014), with those with previous experience (businesses, for example) tending to participate more. 'Volunteer fatigue' may cause individuals to stop participating as may a lack of other volunteers. Orr and Johnson (2018) found that lack of confidence caused by a lack of local knowledge and how best to prepare and respond before, during and after the flood inhibited volunteering. In some cases, members of the at-risk public may

be reticent to participate because they perceive that powerful voices are dominant and this excludes them, others and their local knowledge (Forrest et al, 2018).

Trust/distrust in communications from RMAs is also an important influencing factor. Expectation or assumption that FCERM measures will cope adequately is likely to be a barrier to preparatory measures being taken (Poussin et al, 2014). In the recovery phase, coming to terms with the impacts of a flood and the struggle to rebuild affects people's ability to participate in flood recovery.

The literature shows that recovery is a complex and frustrating 'struggle' or 'fight' hindered by the number of agencies involved. This saps and slows the willingness and ability of some to rebuild their lives, lengthening a painful process. When flood victims are temporarily relocated as a result of the flood, they often find it more difficult to recover (Medd et al, 2015; Interview with expert no.1).

5.3.2 Social and institutional barriers and facilitators

A number of barriers are identified in the literature. Firstly, public engagement and participation in local councils and community ownership is in decline in the UK and presents a potential barrier in itself (Interview with expert no.1). However, England has a network of flood action groups that provides a basis for community engagement. Therefore, the relative frequency of damaging flooding across the country, and in particular flood 'hotspots', appear, if anything, to promote public engagement.

Secondly, in their study of FCERM volunteering, O'Brien et al (2015) found that volunteers possessed a distinct socio-economic profile, suggesting that barriers may exist for those less well represented in the volunteer set, whereas certain factors facilitate those who are well represented to volunteer. For example, they found that 72% of respondents were male; >84% of the sample were older than 54 years and >14% were over 75 years; 97% were white British (black British and Jewish were also represented), 68.25% were retired and 14% worked full time. 63.5% were from rural areas and 36.5% from urban areas. FCERM appears to attract people skilled in various professions such as engineering, civil engineering and landscape architecture.

These results are quite different to data from the 2008 to 2009 Department for Communities and Local Government citizenship, which found volunteers were more likely to be female than male; 42% of formal volunteers were white adults and 34% were from minority ethnic groups; and the 35 to 49-year age group was as likely to volunteer as those of higher socio-economic status. 60% of flood wardens in the O'Brien et al (2015) survey were rural based, and it is likely that this will have affected the age and ethnic diversity of the volunteers they studied.

These findings resonated strongly with the experience of workshop participants who also commented that current engagement approaches typically attract skilled people (often retired) from good socio-economic backgrounds. This raised an additional question about whether there is a bias towards certain groups (for example, a preconceived view about who would be seen as a 'good' representative of the community?). There was concern raised about whether community volunteers are being recruited 'in our likeness' either by organisations assisting or by existing community groups. So, an additional social barrier concerns whether access to engagement make be seen to be 'closed' to certain groups who feel that they do not belong.

Thirdly, Shaw et al (2015) make a strong case for a more organised approach to encourage volunteers to be effectively engaged in flood response and recovery. They propose that national non-statutory guidance is required to inform the official involvement of spontaneous volunteers during a flood. The suggestion is, therefore, that the current lack of such an organised approach is a barrier to more effective participation.

There is some evidence in the literature from Europe and the UK that some state/public authorities may have a limited understanding of the potential role communities and members of the public could play in FCERM (Wehn et al, 2018), and this is a barrier to their participation. One of our expert interviewees (expert no.1) also suggested that public engagement and participation is on the decline in the UK and that this is in itself a barrier. 'Top-down' thinking on the part of the RMAs can be a barrier. Wehn et al (2018) found that members of the public who are at risk of flooding can be viewed as 'only or solely as observers', 'bystanders', 'victims' and 'non-technical'. Other evidence suggests that the aims of flood action groups do not always match those of local residents and so a tension arises which may constrain participation (Forrest et al, 2018).

In places that suffer from deprivation and poverty, it has been difficult to form both flood groups and flood self-help groups. These communities may lack the social capital (networks and relationships or trust between people) that is present in other communities, and this places them at a disadvantage compared with more affluent and better-connected communities (McEwen et al, 2018). How to engage better with the most vulnerable (deprived) and ethically/culturally diverse communities was a key question from the workshop discussion. In some such cases, local branches of charitable organisations (such as the Red Cross and Salvation Army) may provide some assistance.

Other barriers concern issues around risk, responsibility and insurance with regard to volunteers; how to involve more young volunteers in groups where current volunteers are retired and aging; recognition and reimbursement of volunteers; and managing the expectations of volunteers and communities. This point was also supported by workshop participants, where insurance concerns were raised as a key issue. Another barrier is the burden placed on flood victims during their negotiations with insurers (Medd et al, 2015) and concerns over democracy and accountability (Forrest et al, 2018). Trust/distrust in management authorities is also important. Overall, it was found that there is more evidence about participating in and preparing for an incident rather than how to recover from one. The Flood Resilience Community Pathfinder project (Twigger-Ross et al 2015) identifies ways in which community engagement may be promoted successfully, with the main factors encouraging community participation identified as:

- the community's experience and response to a recent flood event facilitated by a trusted intermediary organisation (for example, National Flood Forum (NFF)
- the existence of key individuals such as community activists, leaders and community engagement officers from local authorities, the NFF or other stakeholder organisations
- funding opportunities

The types and models of collaboration found to be most conducive to participation are summarised in section 10.3.

5.3.3 Material barriers and facilitators

Some communities have a lack of social capital due to poverty, and this can be an important material barrier to participation. The perceived financial costs of preparatory measures, such as the costs to businesses of joining a Business Improvement District (see Johnson and McGuinness, 2016) set against levels of financial security influences participation in preparatory measures. The costs of participating were also raised at the workshop as those involved in activities often had associated costs; so, a question was raised about how to remove this burden for individuals and community groups. This is, of course, also a barrier to engagement of certain groups.

5.4 Approaches and models

This section summarises the literature that was reviewed to answer the following research question:

RQ3. What approaches/models of participation encourage/discourage members of the public participating in preparing for incidents and recovery?

In order to be effective and fair, preparing for and recovering from a flood incident needs engagement and commitment from both RMAs and members of the public who are at risk – this provides the baseline of an approach which will encourage the public to participate (Twigger-Ross et al, 2015). The evidence is that engaging a third party such as the NFF is likely to encourage successful partnership and public participation (Greaves and Penning-Rowsell, 2015 and Twigger-Ross et al, 2015). It is important that RMAs invest the necessary time and resources in understanding communities and their key issues and developing relationships before resilience enhancement initiatives are pursued. A community's particular experience of floods, including its capacity, strengths and weaknesses, needs to be understood because it acts as a foundation for participation. The mapping of community groups and considerations about how and when to engage them and by what methods is also considered to be critically important (O' Brien et al, 2015). It is essential to capitalise on existing social capital and possibly embed flood initiatives in wider issues of community concern such as housing, but not much is known about the factors that influence individuals' coping appraisals of flood risks.

Shaw et al (2015) observe that currently the formal organisational structure of emergency response caters inadequately for convergent volunteers (those who turn up during flood emergencies). Organisations need to prepare for volunteers turning up because managing spontaneous volunteers requires a coordinator and site-based volunteer registration may be needed. Volunteers wanting to help during an emergency should be trained. Organisations that want to involve volunteers in emergency response/recovery should develop a coordinated approach.

To encourage participation, RMAs need to carefully nurture, build up and maintain trust over time with intermediaries and members of the public. Loss of trust can be particularly damaging to participation. Community discussion and more creative methods such as role-playing games can help get communities engaged, because it builds empathy between decision-makers and people affected by decisions. It can also create solidarity between interested groups (Interview with expert no.1; Twigger-Ross et al, 2015; and Kelly and Kelly, 2019).

People are more likely to be become engaged when they have experienced flooding and/or they perceive that flooding could directly affect their lives and/or livelihood in the future. Those most likely to become engaged tend to be those already involved in other activities such as environmental concerns and/or political activism (for example, parish council membership which has built up their interests and skills in how the community works (Interview with expert no.1).

In the Upper Calder Valley, setting up and participating in a flood warden network alongside post-flood public consultation meetings and drop-in centres was found to work well, although participation declined quite rapidly with time (Forrest et al, 2018). Also, encouraging community members to be the ears and eyes on the ground as the flood situation develops is a positive aspect that people appreciate. Local flood groups and hubs that sprang up as a result of a) social networks and b) state support and funding, in some cases, encouraged participation. In other cases, a lack of volunteers discouraged participation. Setting up a Facebook page for people to communicate with each other also encouraged participation. Flood action groups appear to be based on

bottom-up collaborative models of participation, where active members of a community are providing advice to other members of the same community.

The importance of creating opportunities through facilitated meetings for representatives from different agencies to talk with householders can create unforeseen opportunities for learning. In Hull, Medd et al (2015) found this approach enabled residents to learn about changes taking place in the policy world, and for representatives from local and central government to better understand local experiences.

5.5 Governance and institutional arrangements

This section summarises the literature that was reviewed to answer the following research question:

RQ4. What types of governance and institutional arrangements facilitate or inhibit members of the public's participation in incidents and recovery?

Devolved local initiatives led by volunteers such as flood hubs and flood groups can be effective in encouraging participation, with members of the community providing useful information to others. In communities where strong community bonds and networks already exist, members of the public are likely to be motivated to participate. In locations where the sense of community identity is weak, or where strong community networks do not exist, there may be less motivation to participate. Also, in locations that suffer from poverty and deprivation, people are unable to spare the time to participate because they have other more pressing basic considerations.

Greaves and Penning-Rowsell (2015) investigated 'contractual' and 'collaborative' models of participation/governance, each of which encouraged members of the public to participate in preparatory measures. Contractual relationships between flood action groups and RMAs are based on the perceived need for separation of the state from the public, and the belief that the only way the community/public can avoid being puppets is through a social contract with the authorities. In this model, a flood is viewed as a breach of the social contract between the state and the community/public.

The second form of governance is a collaborative relationship. Here, in search of 'collective security', the public view their knowledge, social and financial resources as equal and complementary to those of authority, and the state and public are not viewed as separate as in the more Marxist literature. Collaborative models of participation in which local authorities work together to build a trusting and fruitful relationship with community flood groups/residents with the support of third parties such as the NFF and other agencies is considered to be most conducive to participation (Twigger-Ross et al 2015).

O'Brien et al (2015) identified several governance types relating to volunteering, including volunteering for oneself, volunteering direct for the Environment Agency, volunteering in partnership, and volunteering through others. However, overall patterns of response from the online survey and interviews of volunteers did not suggest that any form of volunteer governance is significantly different from any other in terms of facilitating or inhibiting volunteering.

A model that takes a 'co-production of knowledge' approach is put forward by Rollason et al (2018) and Haughton et al (2015) as a way of bringing together the roles and knowledge of experts and lay people (for example, flood engineers and residents). Haughton et al (2015) suggest that this approach is most successful when used collaboratively rather than placing different groups in opposition to one another. Rollason et al (2018) refer to 'participatory working' as an opportunity to rethink how information can be communicated by placing the public at the heart of flood risk communications. Participatory working and learning can be improved by re-imagining the traditional roles

of experts and lay people. For example, lay people often have local flood knowledge (for example, about surface water flooding) that experts do not have, whereas flood experts have other knowledge that lay people do not have. Therefore, this model has experts and lay people working together as equals to co-produce shared knowledge and outputs.

There is a model of collaboration and governance proposed by Johnson and McGuinness (2016) as an innovative, democratic governance structure that encourages small and medium size enterprise owners and managers to 'club' and work together to help reduce their flood risk. BIDs were set up by statute in 2004, setting out an explicit regulatory framework in which a democratic process is a central feature with a ballot of the businesses in the specified area carried out. To set up a BID, a majority vote is required. A levy is then charged on all business rate payers in addition to normal business rates and the levy is used to develop projects that benefit local businesses. There are 200 or so British BIDs: the one in Sheffield was formed to respond to the flood risk.

5.6 Costs and benefits

This section summarises the literature that was reviewed to answer the following research question:

RQ5. What are the costs and benefits (to communities and RMAs) of members of the public participating in preparing for incidents and recovery?

The main benefits of the public preparing for and recovering from incidents is the trust that is built between RMAs and communities, which can then act as a significant foundation for improving resilience to floods in all sorts of ways. The FCERM activity is more likely to lead to success in this way. Collectively involving members of the public, particularly in flood action groups and community action groups, can lead to a more local, context-specific approach to preparing for, responding to and recovering from flood incidents. This approach can integrate well with existing RMA-backed approaches and measures. Benefits include greater community satisfaction with outcomes of FCERM because community voices are heard rather than excluded. The costs of limited or negligible community participation are likely to be less effective FCERM initiatives, potentially putting local communities at greater risk of flooding. When the public participates well there is likely to be greater preparedness and action during (for example, installing and using floodgates and action following flood warnings) and after flood incidents (for example, uptake of insurance) (Dittrich et al, 2016). These actions will help reduce flood damages and enable a better and faster recovery. Some of the costs of recovery may be avoided or reduced if the public is participating in flood preparation, response and recovery.

O'Brien et al (2015) found that 87% of volunteers reported a change in understanding of community flood risk and an 82% change in individuals' knowledge of which agencies are responsible for flood risk issues. There is a reported change in volunteers' understanding of the level of their personal flood risk (75%), of what they can do to reduce their flood risk (63%), and what they can do to recover from flooding (59%). Positive social capital impacts were also identified, including doing something useful in the community; an increasing sense of trust in RMAs; and meeting new people in the community. There were also positive impacts on individuals' wellbeing. The most significant impacts were improvements to individual skills and knowledge (70%); a sense of feeling that they are making a positive difference to the local environment (68%); and a sense of connection to the local environment (63%). O'Brien et al (2015) used different value for money measures: relevance, effectiveness and efficiency measures. The relevance measure of value for money was best met by volunteering carried out 'for themselves'. The effectiveness measure of value for money showed less variation between governance types, although volunteering 'through others' scored lowest against

building community resilience to flooding. The efficiency measure of value for money was best met by volunteering 'through others', although volunteering 'direct for Environment Agency' fitted in best with volunteers' lifestyles and organisation/agencies' working cultures. Even so, overall, no form of governance appears to be better than the others.

Important knowledge, skills, attitudes and values are developed through the process of the public participating in preparing for and responding to incidents. Participation leads to learning and helps develop knowledge of flood resilience, resilience skills, attitudes and values. RMA staff see engagement as an opportunity to educate and inform local people at risk of flooding, enabling them to provide expert scientific knowledge to residents and helping support people in flood risk areas to become more resilient and self sufficient.

Formal consultations have a cost to the community as well as to the RMAs carrying them out (Interview with expert no.1). To members of the public, the cost includes the time to be involved in the consultation and also more informal participation such as members of flood action groups providing advice to other at risk members of the public or attending group meetings. There are also financial costs to homeowners through purchasing floodgates and insurance. The pressures of allocating time to participate may create stress and knock-on health problems. Apart from the costs of formal consultations, the main cost to RMAs is the time and effort involved in gaining a good understanding of a community, carefully nurturing and building trust and working with communities and their members who can sometimes be inconsistent, contradictory or in conflict over aspects of flood risk management or related community matters (Greaves and Penning-Rowsell, 2015).

5.7 Conclusions and evidence gaps

Successfully engaging communities at a time when general public engagement in local institutions is declining is challenging. However, flooding poses a unique risk with very disruptive and harmful consequences which should help meet this challenge.

Very good examples of public participation in preparing and responding to incidents exist within the literature but much less is known about recovery (Medd et al, 2015) and collective engagement of businesses. The recovery process needs further investigation in order to better understand its medium to long-term mental effects and its challenges. Models of collective participation by businesses also need further investigation, including the further potential of Business Improvement Districts. Public participation in flood action groups and similar community groups that have engaged with flood risk is difficult to sustain over time as Forrest et al (2018) and Greaves and Penning-Rowsell (2015) found in their case studies.

There is plentiful evidence of individual/psychological and particularly social/institutional participation barriers and facilitators. There is strong evidence of approaches and methods that may be used to encourage and build public participation – particularly from the Flood Resilience Community Pathfinder evaluation final report - and the models of governance that facilitate it, as well as the costs and benefits of participation (Twigger-Ross et al, 2015). However, successful ways and methods of engaging deprived communities requires investigation. Not much appears to be known about how formal consultation procedures (for example, over land acquisition, river improvements and construction of FCERM measures) interact with and affect public participation in preparing and responding to flood incidents, and whether or not it affects it adversely. This may be an area worthy of further research. The workshop participants felt that a lot of knowledge already exists around engaging communities with regards to incident recovery and response, but it has yet to be captured. The evidence and findings of this

analysis are more indicative than representative, and this should be borne in mind when drawing conclusions from the findings.

6 Taking part in decisions, designs and funding for schemes

Key findings:

The UK is advanced in creating public groups that have the potential to make decisions. However, the opportunity for the public to influence those decisions is limited. This is, in part, due to limited access to all stages of an often-complex funding and decision-making process. Also, once funding is agreed, the public do not always have access to decisions regarding implementation, including construction and maintenance.

Local social, cultural and economic characteristics can inform the public's ability and inability to gain access to and engage in FCERM decision making.

There is a lack of specific research exploring decision-making approaches and success stories in the public being included in FCERM decision making.

6.1 Introduction

This chapter includes the activities where communities are involved in both developing and funding FCERM schemes. This includes how communities become engaged in deciding what types of schemes are appropriate to address a specific FCERM problem. FCERM strategies such as SMPs or flood isk management plans (FRMPs) are out of scope in this chapter because they are covered in chapter 9.

Overview of the literature

This review focuses on 7 key papers (1 systematic review and 6 empirical papers). Of the empirical papers, 3 used a qualitative approach and the others used mixed methods.

Key topics explored by the papers included:

- ability of interested groups to influence the development and implementation of FCERM schemes
- local capacity to participate in decision making
- how current engagement in FCERM schemes works for all interested groups involved
- co-production as a form of decision-making

6.2 Extent and type of public participation

This section summarises the literature that was reviewed to answer the following research question:

RQ1. To what extent and in what ways are members of the public participating in decisions, designs and funding for schemes?

All 7 papers identified an aspiration to include people in making decisions about FCERM at a local level in the UK through community groups. Mees et al (2016) carried out research across 5 European countries, through documentary analysis and 40 to 70 semi-structured interviews per country. They found that England is more advanced in developing public groups and that decision making occurred at a strategic funding level rather than in implementing agreed schemes.

Moon et al (2017) carried out a critical analysis of 3 Belfast flood forums using a mixed methods approach (including observation), 64 household surveys and 4 semi-structured interviews. This research found that there was limited attendance at meetings discussing a local drainage issue. From observation, it was concluded that two-way dialogue was not achieved and a survey of attitudes of the public in relation to their representation found that:

> *"a significant proportion of the respondents do not feel they have been represented to a satisfactory extent in flood risk decision-making processes in their area. 60.9% (n = 39) stated that they are not being adequately represented, 28.1% (n = 18) believed that current representation is adequate, while the remaining 11% (n = 7) did not respond."* (Moon et al, 2017, p.414)

Forrest et al (2017) carried out an online survey of 40 flood action groups and qualitative interviews representing 6 of them. They identified 2 types of membership: permanent volunteers and 'convergent' citizens who join when emergencies occur. They found that flood action groups mainly focus on actions such as clearing ditches, flood recovery, advocacy and influencing local schemes. This paper's main focus is on the ability of public groups to participate in decision making rather than on the effectiveness of different approaches to decision making carried out within those groups.

6.3 Barriers and facilitators

This section summarises the literature that was reviewed to answer the following research question:

RQ2. What are the barriers and facilitators to members of the public participating in decisions, designs and funding for schemes?

Compared with other European countries, flood risk policy in the UK is driven by the need to build local resilience (Forrest et al, 2017). Mees et al (2016) considered that because it has no statutory right to flood protection, the public takes action itself to try to resolve local flood risk. Begg et al (2015 and 2018) carried out 12 qualitative interviews with flood management professionals and associated organisations in England and Saxony, Germany. They found that the expert-led approach to funding limited local decision making, affecting the physical options selected to reduce flood risk. Similarly, Mees et al (2016) also found that the professional-led cost efficiency approach limited public involvement in decision making. Moon et al (2017) found that where decisions were to be made, the public were sometimes excluded from technical sessions, and in cases where they were included, the materials used were too technical for public participation. It was also revealed that the form of participation in the local flood forums actively excluded the public in decisions by not placing interested groups at the centre of the

decision-making process and not engaging in two-way dialogue. This resulted in the creation of an 'illusion of inclusion.' Other papers also found that broader participation in decision making was either limited or enabled by local political and cultural issues. In some cases, local social capacity and motivation to get involved increased after a recent flood event and if those affected owned the property at risk (Forrest et al 2017; Mees et al, 2016). Thaler and Keitel (2016) studied social capacity in the form of available social power and resources. They carried out 15 qualitative interviews as part of 3 case studies in England and found that the motivation for forming and maintaining decision-making groups was influenced positively not only by a flood event happening, but also by the presence of policy-related networks already in place and negatively by higher local levels of deprivation.

In terms of encouraging participation, a systematic review of flooding and heatwaves in the UK by Howarth and Brooks (2017) revealed the importance of co-production, collaboration and communication in decision making. Mees et al (2016) defined co-production as not only public involvement, but also involvement in providing services. This, according to Moon et al (2017), includes agenda setting, with public involvement clearly setting out roles and responsibilities that make public stakeholders central to the decisions to be made, being involved not only in making them, but also in decisions about implementation. Moon et al (2017) also refer to Abelson et al (2003), highlighting the importance of reducing decision biases through 'adequate representation of those affected by a decision, creating more clarity and legitimacy.'

6.4 Approaches and models

This section summarises the literature that was reviewed to answer the following research question:

RQ3. What approaches/models of participation encourage/discourage members of the public participating in decisions, designs and funding for schemes?

Of the 7 papers reviewed, 6 discuss models of participation in relation to the analysis of their research findings rather than exploring actual approaches or models to gain or hinder public participation in decision making. However, Maskrey et al (2016) explore a component of scheme decision making in terms of identifying local FCERM options. This is framed within the context of a staged decision approach for selecting scheme options: a) problem definition; b) objective setting; c) benchmark development and setting; d) intervention option scoping and identification; e) intervention option appraisal and f) intervention option recommendation/selection. Applying a participatory modelling approach (co-production), which involves mixed methods qualitative action research with 40 stakeholders in Hebden Bridge, including representatives of the local communities, a structured approach was developed to capture both expert and the local knowledge of local interested groups. The output was intended to inform the formal appraisal process. In conclusion, the research advocates this structured facilitation approach in identifying options and possibly using it more widely in FCERM decision making, supporting knowledge exchange and consensus-building. In this case the research took technical numerical knowledge and translated into a format that it could be understood by non-expert groups enabling public inclusion in the decision-making process.

6.5 Governance and institutional arrangements

This section summarises the literature that was reviewed to answer the following research question:

RQ4. What types of governance and institutional arrangements facilitate or inhibit members of the public's participation in decisions, designs and funding for schemes?

Begg et al (2018) found that the context in which decisions are made tend to be expert-led and are framed and rationalised from an economic perspective through the partnership funding approach. This, in turn, limits local decision making where there is no ability to influence decisions, because they depend on the local socio-economic context (for example, deprivation levels, urban versus small rural characteristics). Also, drawing on a report by the National Audit Office (2014), the authors found no evidence of participation in decisions related to post-funding FCERM scheme design, construction and maintenance.

6.6 Costs and benefits

This section summarises the literature that was reviewed to answer the following research question:

RQ5. What are the costs and benefits (to communities and RMAs) of members of the public participating in decisions, designs and funding for schemes?

Moon et al (2017) found that in Belfast a high proportion of surveyed participants said they preferred political rather than local participation, in other words, being represented by their politicians in decisions rather than representing themselves. Begg et al (2018) found possible inequalities in participation in FCERM scheme decisions because interested groups were unable to participate or, if they did participate, they were unable to influence decisions. Wehn (2015) found that because of constraints on how decisions are made, interested groups could end up frustrated and in conflict. However, Wehn's paper is unclear if this applies to the public or to all local interested groups such as professional organisations.

Forrest et al (2017) found that an important role of the flood action group is to influence and lobby for local FCERM investment and local property insurance cover. The community flood action groups' main focus is to share knowledge and support small-scale maintenance activities rather than larger scale activities due to their restricted access to resources. Overall, for all the papers reviewed in this chapter, there are public groups that can potentially participate in making decisions, but the research did not present success stories, but rather challenges to success.

6.7 Conclusions and evidence gaps

A key finding is the lack of academic research specifically exploring which public groups are participating in decision making, the decision approaches applied with the public groups and the level of success associated with these approaches. While one paper does carry out a detailed analysis of one form of decision approach (participatory modelling), there are likely to be many others that have not yet been researched. The focus is more on the ability of the public groups and participating individuals to influence decisions. The challenges of the public being able to engage in complex funding schemes and to influence those decisions is exclusively focused on the funding of schemes but not on their design, construction and maintenance. Also, the specific requirements of coastal decisions are not explored. In terms of the decision process, the importance of making the public central to that process is considered essential as a basis for participatory decision making. However, challenges are presented not only by the funding mechanisms, but also by the particular local socio-political and flood event contexts that enable representatives of a community to be motivated and able to engage in FCERM scheme decisions.

7 Managing land to achieve flood risk benefits

Key findings:

Previous personal experiences involving flooding events and dealings with flood risk experts are the main motivators for members of the public to participate in implementing natural flood management (NFM) and sustainable drainage systems (SuDS).

Greater equality and equity in how knowledge is gather and produced would help build trust and partnerships between communities and RMAs.

There is lack of evidence of the tools and approaches required for authorities to help both engage and work with farmers and landowners.

The knowledge gap of how to tackle pre-existing ways of working (for example, legacy lock-ins) that impede new approaches on NFM needs to be addressed to achieve participation.

Given the different perspectives of members of the public and contexts on involvement with flood management, RMAs need to use diverse forms of engagement in order to successfully engage people. However, a toolkit of engagement strategies suitable for different perspectives and contexts appears to be missing.

The benefits to communities and RMAs of members of the public participating in managing land appear to considerably outweigh the costs.

7.1 Introduction

This chapter focuses on communities engaged in how land is managed to achieve flood risk benefits through NFM, spatial planning, SuDS and other mechanisms such as countryside stewardship schemes.

The chapter looks at:

- how, why and for how long they participate
- the activities in which they participate
- the factors which facilitate or hinder participation
- models of participation and governance
- costs and benefits of participation
- why participation is considered to be important and evidence gaps

Overview of the literature

The review for this chapter is based on 10 research papers, which were qualitative studies containing empirical evidence, 2 review papers, one case study report, one guide and 2 expert interviews. All papers were from the UK, 6 of which include English case studies and 2 that cover Scottish case studies. Most of the studies had small sample sizes, with between 8 to 18 individuals participating in interviews, workshops and surveys. The 2 exceptions to this were in the studies by Mehring et al (2018) and Smith et al (2018), which include 62 and 109 questionnaire respondents respectively.

7.2 Extent and type of public participation

This section summarises the literature that was reviewed to answer the following research question:

RQ1. To what extent and in what ways are members of the public participating in managing land to achieve flood risk benefits?

The publications reviewed described a range of activities involving natural scientists, social scientists, RMAs, members of the public (including farmers, landowners, local members of the public) volunteering and/or acting together in groups to implement NFM and blue-green infrastructure (BGI) schemes. The literature reviewed covered the following forms of participation:

- social and natural scientists as part of rural economy and land use project collaborating with residents affected by flooding in 2 localities through a 'competency group' – a forum created for collaborative thinking, generating new collective competences and redistributing expertise (Whatmore and Landstrom, 2011)
- local community (directly and through flood action groups), local RMAs and land managers participating in a partnership project with the local council. The appointed project officer was instructed to report to a steering group chaired by members of the local community flood action groups (see Stroud case study in Burgess-Gamble et al, 2017)

A strong motivating factor for participating in NFM relates to previous personal experience of being involved in flood events and dealings with flood risk experts (Whatmore and Landstrom, 2011). Those affected by flooding may get involved in order to challenge or scrutinise expert knowledge (Whatmore, 2014). Others are motivated to participate because it is an opportunity to engage with and inform, flood science or agree on the implementation of an NFM scheme (Lavers and Charlesworth, 2018). A more ambitious motivation was also observed among some groups who wanted to 'make a difference' to perceived political standstill when it comes to implementing NFM measures in their communities (Whatmore and Landstrom, 2011).

As indicated by expert no.2, public engagement is difficult to sustain when schemes or research collaborations end. In a case study from Bristol, Everett and Lamond (2018) found that there was very little maintenance of blue-green infrastructure (BGI) after it had been implemented. Eventually this led to it deteriorating and residents apparently disowning it. The lack of strategy and budget for engagement after the event prevented meaningful engagement from the landowners (Everett and Lamond, 2018). The reviewed studies also provide good examples of sustained engagement on NFM projects once they are complete. For example, the Environment Agency's NFM evidence directory (Burgess-Gamble et al, 2017) provides a case study of the Stroud Rural SuDS scheme where NFM measures will continue to be maintained by landowners. Furthermore, the initial participation by local members of the public in a local consultation (pre-2010) has continued through the NFM partnership project with Stroud District

Council (2014 to 2020). Lavers and Charlesworth (2018) also found in another study that farmers participating in GIS scoping and engagement also pledged their willingness to accept management and maintenance responsibilities of NFM measures after they had been implemented.

The publications reviewed showed that members of public involved in NFM mainly carried out the following:

- **campaign-focused activities** – for example, presenting posters, visual materials using slide shows and screening a video documentary on bank erosion in a public exhibition and taking part in flood planning (Whatmore and Landstrom, 2011; Burgess-Gamble et al, 2017)
- **virtual activities** – for example, creating a website as resource depository for materials generated by group members (such as maps, transcripts), group blogs, GIS scoping (Whatmore and Landstrom, 2011; Lavers and Charlesworth, 2018)
- **knowledge-focused activities** – for example, field visits, catchment walkovers, archival research and video recording (Whatmore and Landstrom, 2011; Burgess-Gamble et al, 2017)
- **physical activities** – for example, constructing BGI (such as SuDS, NFM measures), maintenance and monitoring (Potter and Vilcan, 2020; Everett and Lamond, 2018). Examples include river restoration, raising water-absorption capacity in soils, promoting natural channelling and improving green infrastructure (Smith et al 2014; Everett and Lamond, 2014)

7.3 Barriers and facilitators

This section summarises the literature that was reviewed to answer the following research question:

RQ2. What are the barriers and facilitators to members of the public participating in managing land to achieve flood risk benefits?

The literature reviewed has considerable evidence of the individual/psychological and social/institutional barriers and facilitators to participation.

7.3.1 Individual/psychological barriers and facilitators

Personal attitudes, open-mindedness and trust/confidence often determines people's willingness to participate (Whatmore et al 2014; Holstead et al 2017; Waylen et al 2018; Smith and Bond, 2018; Everett and Lamond, 2013). According to expert no.6, an individual's personality impacts participation in BGI implementation. The expert stressed that some people see themselves as engaging types and others don't. The interviewed expert also noted time availability and language skills as potential barriers for participation. Whatmore et al (2014) found that a person's lack of trust in scientific models and difficulties engaging with different kinds of expertise and logic can lead to a loss of confidence in FCERM, making collaborative working more difficult. Individuals are also likely to hold different views, values and therefore perspectives that influence decision making and participation. An important issue is people's lack of 'ownership' of flood risk. This is associated with stakeholder refusal or denial of flood risk and the need for protective measures (Everett and Lamond, 2013; Everett and Lamond, 2014). Fears for health and safety due to water bodies or antisocial behaviour cause dislike of BGI among communities and may further constrain their participation (Everett and Lamond, 2014; Everett and Lamond, 2018; Everett and Lamond, 2014). Waylen et al (2018) found that collaboration and engagement of local members of the public was restricted by different

goals and interests of individuals and institutions. A survey by Holstead et al (2017) showed that people's decision to participate in NFM was also influenced by public perception. The potential to be labelled a 'slipper farmer' (farmers who claim subsidies without actually working the land) and the unattractive visual appearance of some NFM features could reflect badly on land management skills, affecting respondents' decisions on whether to include NFM measures on their land. The uncertainty among farmers on the benefits of these land management approaches was also raised at the workshop and could be considered a factor in their decision making.

The need for people to change their behaviour can be an important barrier to their participation in the implementation and maintenance of BGI (Everett and Lamond, 2014). Behavioural changes required could include emptying water butts, attending to green roofs and not littering ponds.

Previous experience of flooding appears to be an important trigger for uptake of NFM and SuDS measures (Holstead et al 2017; Mehring et al 2018; Everett and Lamond, 2013). This observation was also expressed by the interviewed expert no.2 as part of this review. From the survey by Holstead et al (2017), it was found that the likelihood of implementing NFM measures increased if there was a history of flooding. Over a third of farmers with a history of flooding responded that they are likely or very likely to implement measures within the next 5 years compared with only 5% of farmers with no history of flooding (Holstead et al 2017). The following factors that can both encourage or prevent the uptake of NFM and SuDS measures have been identified (Smith and Bond, 2018; Everett and Lamond, 2013; Everett and Lamond, 2014):

- knowledge and awareness of flood risk (also noted by expert no.6)
- feeling part of a community (also noted by expert no.6)
- understanding flood protection measures
- motivation and opportunity to participate
- available resources
- time availability

Expert no.3 noted that the lack of awareness of flood risk when living in an internal drainage board district was a barrier for participation in land management among members of the public. The expert also noted that it is common that local members of the public are unaware of programmes that protect them from flood risk.

7.3.2 Social and institutional barriers and facilitators

Holstead et al (2017) carried out an online questionnaire survey, which found that local tradition is a major social barrier affecting the participation of Scottish farmers in NFM. Respondents viewed NFM as an 'insult' to past generations, as it was seen to reverse their achievements and move away from their main role as food producers. Waylen et al (2018) also note that both formal and informal cultures and traditions can hinder attempts to introduce new concepts and practices such as NFM. Resistance to new types of knowledge by both members of the public and authorities can further constrain implementation of NFM measures (Waylen et al 2018).

Everett and Lamond (2014) found that the social motivations that may impact participation include notion of comfort, social norms, and the fashions and tastes of social groups. For some communities, the fear of de-gentrification or contrastingly gentrification may discourage take-up of BGI measures (Everett and Lamond, 2014). Also, the meanings different social groups attach to spaces and the perceived benefits from BGI can differ and impact their decision to participate (Everett and Lamond, 2018).

The presence of a champion that takes on the responsibilities of contacting, reporting and soliciting input from the local community is important for achieving participation in NFM (Whatmore and Landstrom, 2011). Meanwhile, Everett and Lamond (2013) confirmed that some communities believe that ensuring flood protection is a state duty rather than a personal responsibility and therefore doesn't require their participation.

The institutional context can be a barrier and facilitator to participating in NFM. In their study, Whatmore and Landstrom (2011) found that among the local interested groups there was an ongoing debate around the need for public authorities to seek local knowledge in an open-minded way. This is supported by Lavers and Charlesworth (2018) who found that local engagement is commonly under considered, particularly in early phases of opportunity mapping as part of NFM planning. Furthermore, the authorities and members of the scientific community in some cases view public scrutiny as something to be avoided (Whatmore, 2014). This is due to concerns over the capacity to handle scientific uncertainties and emerging political contestation. Holstead et al (2017) carried out a survey in Scotland, and found that contradictory and incoherent policies lead to reluctance among farmers to take action to reduce flood risk.

Some members of the public believe that the main barrier for local participation in NFM is the lack of advice and available information. Providing personal support and clear information may address this issue (Holstead et al 2017). However, there is evidence that authorities struggle to include all groups who could be affected or need/want to be informed (Smith and Bond, 2018). Furthermore, the quality of communication with farmers and landowners is also viewed as impacting the implementation of NFM measures (Waylen et al 2018). For example, excessive bureaucracy associated with applications for funding to implement NFM measures is seen as unappealing among local members of the public (Holstead et al 2017). Various studies found that relationships with, and a lack of trust in, authorities is further constraining participation in NFM and SuDS (Whatmore and Landstrom, 2011; Smith and Bond, 2018; Everett and Lamond, 2013). As highlighted by Everett and Lamond (2013), some communities may not accept labelling from above or outside their social circle for fear that it will harm their properties.

Finally, Holstead et al (2017) refer to previous research on farmers' decision making on NFM schemes, where it was found that social and institutional factors can motivate or discourage participation. These include family situation, farming culture and policy landscape, information flows and social capital.

During an interview, expert no.2 noted that authorities with great skills in communication facilitate participation. The expert indicated that civil engineers that are often responsible for implementing FCERM measures typically do not have this in their skill set.

In exploring the factors that restrict the implementation of SuDS, Potter and Vilcan (2020) noted that the planning system is weakened by lack of stakeholder collaboration. A particular challenge for improving the quality of SuDS is attributed to an unequal relationship of power between developers and local councils. From interviews with experts, Potter and Vilcan (2020) found that when institutions consider whose interests are prioritised, developers often take advantage. This is associated with the existing development process in England, which relies on private money coming forward to develop sites. In terms of improving SuDS implementation and multi-functionality, the study acknowledges that lead local flood authorities (LLFAs) have identified the need to forge closer links with landscape architects.

7.3.3 Material barriers and facilitators

Most of the publications reviewed highlight financial capital and economics (for example, farm viability) as the primary facilitator of farmer and land owner engagement with BGI

(for example, NFM) (Lavers and Charlesworth, 2018; Whatmore and Landstrom, 2011; Holstead et al 2017; Waylen et al 2018; Smith and Bond, 2018; Potter and Vilcan, 2020; Everett and Lamond, 2018; Everett and Lamond, 2014). In cases where funding is unavailable or the potential measures may be unviable for farm businesses, they are considered as major barriers for participation. The issues associated with finance and economics that limit the uptake of NFM measures include the practical costs of changing land; profitability of other potential land uses (Waylen et al 2018); property value concerns (Everett and Lamond, 2013; Everett and Lamond, 2014); the long-term ownership, installation, management and maintenance costs of BGI measures (Lavers and Charlesworth, 2018; Everett and Lamond, 2013; Everett and Lamond, 2018). From interviews, expert no.2 noted that installing BGI often conflicts with profitable land management practices. The expert also emphasised the existing notion among landowners and farmers that implementing BGI takes time, and time for them is money. Another important barrier for stakeholder engagement is the time it takes for BGI to offer the desired services (for example, flood protection, habitat provision, and leisure space) (Everett and Lamond, 2013).

Holstead et al (2017) found strong links between knowledge of funding mechanisms and the probability of implementing measures in the next 5 years. Those who were aware of NFM funding mechanisms (for example, the Countryside Stewardship scheme) were more likely to implement measures in contrast with those who didn't know.

7.4 Approaches and models

This section summarises the literature that was reviewed to answer the following research question:

RQ3. What approaches/models of participation encourage/discourage members of the public participating in managing land to achieve flood risk benefits?

Society is becoming more complex in its demographic make -up and therefore can pose a challenge to engaging with the public. Any approaches/models of participation to encourage the engagement of members of the community at risk of flooding requires a good understanding of its social dimensions (Colvin et al, 2016). The diverse nature of flood-affected communities and their perspectives requires diverse forms of engagement by the RMAs to be successful (Mehring et al 2018; Smith and Bond, 2018). Smith and Bond (2018) identified 5 different FCERM engagement perspectives: 1) knowledgeable, 2) politically aware 3) sceptical and pragmatic, 4) sceptical and locally attuned and 5) engaged and disengaged. Engagement strategies should consider these different perspectives in order to achieve meaningful participation and should also be aware of the different motivations, levels of trust and values in terms of importance of involvement among different communities. For example, seeking equitable partnership working with groups who are seeking readymade solutions will result in challenging engagement processes, which are likely to create a breakdown in communication and relationships (Mehring et al 2018).

Developing a shared understanding of local flooding situations through a combination of knowledge and experience is seen as vital for communicating, learning, negotiating and reaching collective decisions among different people and groups involved in partnership working (Mehring et al 2018). This is supported by the Environment Agency's NFM evidence directory (Burgess-Gamble et al, (2017), which highlights that by working with landowners rather than imposing a decision on them, this resulted in full cooperation and the implementation of NFM measures. In contrast, a top-down and technocratic approach with strong knowledge hierarchies can lead to breakdowns in collaborative working and build barriers between flood authorities and 'lay people' (Mehring et al 2018). Everett and Lamond (2018) also highlight the urgency for authorities to move beyond the DAD (Decide, Announce & Defend) model towards an EDD (Engage,

Deliberate, Decide) approach. Expert no.6 also shared this view, noting that people do not like to be patronised.

Various studies highlight the different approaches/models of participation that are believed to encourage shared understanding and successful engagement of members of the local population. Whatmore and Landstrom (2011) used a range of objects such as printouts of maps, photos and satellite images to translate individual experiences into shared knowledge. As part of this exercise, local members of the public were asked to modify a map of recent flood events from their experiences and observations and share their recollections of flooding in their town going back several decades. Referred to as the 'slowing down' of reasoning, this approach helps share and discuss the knowledge and evidence of those affected by the flooding. Furthermore, this approach is considered to allow local members of the public to more closely examine expert knowledge and to try out alternative ways of framing and addressing the problem of flood-risk management informed by their experiences and observations (Whatmore and Landstrom 2011). Using case studies, Everett and Lamond (2018) identified the following approaches to local stakeholder engagement: door knocking; presenting/discussing plans using maps; public consultation; community engagement after the event. The authors found that the success of engaging local interested groups in BGI implementation varied between different approaches. For example, one of the case studies showed that the one-to-many information dissemination approach (for example, council website, leaflets) led to only nominal public involvement (Everett and Lamond, 2018). Smith et al (2014) found that 'citizen scientist' engagement models can be a successful approach for local stakeholder participation.

Ensuring farmers participate in NFM is considered important for successful uptake and implementation of these measures. Lavers and Charlesworth (2018) found that early engagement can help support farmers' decision making and increase their receptiveness to NFM measures. The importance and value of such an approach was also stressed by expert no.2 and expert no.3 as part of this review. Approaches such as participatory mapping of potential measures and visualising those on the ground could also prompt reflection on pre-existing assumptions and expectations and support their willingness for uptake (Waylen et al 2018; Levers and Charlesworth, 2018). Meanwhile, Holstead et al (2017) argue that advice on implementing NFM measures should be given to farmers on a one-to-one basis by trusted independent intermediaries, such as farm advisors or local catchment organisations.

Other inventive methods considered to spark interest in NFM include using film and drama and producing school projects for local communities (Smith and Bond, 2018; Everett and Lamond, 2018). Expert no.6 also noted that engaging with children from local schools might provide a captive audience in order to engage with their parents. The expert also indicated creating a memory book in relation to previous flooding experiences could be useful. This has proven to help develop local networks and encourage others to participate in FCERM.

NFM is not likely to be successful without the enabling tools that help interested groups decide what land use changes to make and where in the catchment to make them. Polyscape (as described in Ciria, 2013) as a visualisation and decision support tool is suitable for participatory land use planning. It is aimed at helping negotiation between interested groups to improve NFM. In particular, it helps farmers and landowners to engage with hydrologists, natural scientists and agri-economists in identifying acceptable land use trade-offs. By incorporating local knowledge, the tool helps to identify where farmers are willing (and unwilling) to contemplate land use changes. Incorporating local knowledge is important to ensure interested groups apply the tool. This could also lead to interested groups being more likely to take ownership of its outputs. The proposed stakeholder engagement methodology involves 6 steps:

- scoping phase – identifying key ecosystem services

- specification developed for mapping – generated collectively with local interested groups and experts
- data gathering to produce maps, incorporating local knowledge, where appropriate
- development of algorithms
- producing mapped output
- presentation of results to local interested groups for validation

To achieve stakeholder 'buy-in', the method provides opportunities for iteration with new specifications or data incorporated as appropriate. The final output from this process provides material for further negotiation. It identifies areas of opportunity and tension in land use decision making and ecosystem service provision (CIRIA, 2013).

Everett and Lamond (2013) refer to Bubeck et al (2012), highlighting that solely focusing on awareness could disempower people and encourage fatalism, refusal and blind hope. To inspire action, the authors acknowledge that awareness raising works best alongside advice about protection measures.

7.5 Governance and institutional arrangements

This section summarises the literature that was reviewed to answer the following research question:

RQ4. What types of governance and institutional arrangements facilitate or inhibit members of the public's participation in managing land to achieve flood risk benefits?

In order to build trust and create more robust partnerships with RMAs, many flooded communities would like to see greater equality and equity in how knowledge is gathered and produced so that they get to have a say in how flood risk is managed locally.

Mehring et al (2018) examined the Environment Agency's 'Working with others' guide (Environment Agency, n.d.) to suggest ways of improving it to encourage public participation in FCERM. They argued that technocratic ways of working that drive knowledge and power hierarchies are still evident in this guide. In order to continue viewing community engagement as means to an end it is believed that authorities should recognise the value of simply listening to communities and learning about their experiences and fears in order to acquire their knowledge and understand their ideas (Barnes and Schmitz, 2016; Mehring et al 2018). This was also reaffirmed by expert no.3 as part of this review. A couple of studies stressed the importance of establishing better links between research, policy and practitioners that would enable learning to be shared and lessons learnt in how to incentivise landowners to participate in NFM (Waylen et al 2018; Lavers & Charlesworth, 2018). This view was shared by workshop participants who felt that it would be useful to have case studies and evaluations available that present how the different barriers to participation have been overcome.

Whatmore and Landstrom (2011) introduced collaborative working practices between academics and local members of society affected by flooding. This arrangement is believed to give voice to the collective knowledge claims of the local members, and acts as a representative which public authorities are expected to take seriously or could not be easily dismissed. Whatmore (2014) argues that the emergence of this engagement model empowered local people to become involved in producing alternative NFM strategies. This changed the local debate on flood risk and opened up a space for discussing issues differently. The authors propose to ensure conditions that help involve people who are more proactive and bear the power to object and intervene in matters that concern them.

Holstead et al (2017) highlight that the availability of a point of contact can help increase the interest among farmers to participate in NFM. Such a point of contact should provide clear information and support in a case of need. It should also offer higher financial incentives with long-term contracts. The authors suggest that the financial mechanisms should give a level of compensation that competes with dynamic market prices, reduces paperwork and are linked to other agricultural policies and payment schemes. Furthermore, it is recommended that such advice and support should come from a trusted intermediary (for example, catchment organisation or facilitator external to government). Finally, the authors argue that:

> *"a catchment plan that highlights shared responsibility, and is part of an integrated flood management policy, covering not only rural areas, but also urban at the catchment scale, may be more successful in encouraging farmers to engage with NFM."* (p.214)

Developing such a plan would require reconsidering policies surrounding urban planning (Holstead et al, 2017).

From workshop discussions with local members of the public in Orford (Suffolk), Smith and Bond (2018) found that many people favoured participation in practical projects such as 'active neighbourhood watch' type schemes. This study held a workshop with local members of the public who identified a range of solutions to encourage public participation, including:

- authorities taking information to the people (for example, in village shops, garages, pubs)
- authorities providing information on the work in progress at local sites
- improving feedback (for example, by using local media)
- involving more groups at risk (for example, commercial groups)
- the Environment Agency using local events to familiarise communities with its roles and aims
- ensuring better accessibility to local government agents responsible for flood management decisions

Various studies highlight the importance of involving communities at different stages of the BGI planning process to encourage engagement. Potter and Vilcan (2020) referring to White and Howe (2005) highlight 4 phases of the planning management process to categorise the challenges to using SuDS. These include: (1) pre-application; (2) planning negotiation and decision-making on outline and detailed design; (3) final planning approval for construction, adoption and maintenance; and (4) planning inspection and enforcement of SuDS construction and maintenance. The importance of collaborating with interested groups at the pre-application stage is emphasised. This should help agree on the SuDS scheme and its implementation (Potter and Vilcan, 2020). Everett and Lamond (2018) found that local interested groups are often not involved when the final decisions are made on developing and implementing BGI measures. This also occurs where interested groups have been involved in consultation. The lack of engagement after the event can lead to a lack of sustained engagement after BGI measures have been implemented.

The pre-existing ways of working, such as fixed appraisal processes, pre-existing budget allocations and top-down centralist decision-making structures appear as the main constraints for local members of public to participate in NFM (Waylen et al 2018; Mehring et al 2018).

In an interview, expert no.2 emphasised the need for people with strong people and communication skills within authorities to be leading on public engagement. This could increase responsiveness to flooding and build awareness for the next time it occurs.

Everett and Lamond (2013) argued that authorities should build knowledge collaboratively in order to reach consensus. This can increase stakeholders' belief in the effectiveness of the BGI measures proposed. Supporting this with economic analysis for estimated costs and projected savings can further build stakeholder support and engagement in implementing BGI measures.

Fines, subsidies, threats of litigation or rewards can provide the required motivation for stakeholders to change behavioural patterns, which are essential to ensure longer-term BGI sustainability (Everett & Lamond, 2014).

7.6 Costs and benefits

This section summarises the literature that was reviewed to answer the following research question:

RQ5. What are the costs and benefits (to communities and RMAs) of members of the public participating in managing land to achieve flood risk benefits?

The main benefits to members of the public in participating in NFM are building relationships with policy makers and the solutions developed and implemented to tackle flood risk as a result. From the interviews, expert no.2 noted that public participation in FCERM can be good in itself as part of good democracy practice. The expert also stressed that stakeholder participation and the knowledge gained from it should improve decision making in general. Potter and Vilcan (2020) argue that stakeholder involvement in planning and implementation of SuDS can enable authorities to exploit opportunities and overcome constraints of their design. The study by Whatmore and Landstrom (2011) highlights a range of benefits of engaging with local communities. These include significant cost savings from supporting the development of a flood model and efficiently identifying locations for works; improved relationships and trust between local members of the public and researchers; gained public support on the proposed NFM interventions. Additionally, a case study from Stroud (Burgess-Gamble et al, 2017) stressed that the most significant benefit from community engagement in NFM is the emergence of positive partnerships with RMAs. This can build trust and lead to more productive ways of working that create better and more effective solutions (Mehring et al 2018). Smith et al (2014) argued that stakeholder participation in NFM measures (for example, river restoration) can lead to more extensive post-project appraisal.

Using local knowledge can identify NFM interventions to address hydrological issues (Lavers and Charlesworth, 2018). Furthermore, participatory processes and partnership working can create a degree of knowledge overlap, generating exhaustive understanding of the sources, pathways, impacts of flooding. This can result in more impactful NFM responses (Löschner et al, 2016). Other benefits of participation considered include the increase in, awareness of, and preparedness for flooding alongside greater resilience to flooding in local communities (Löschner et al, 2016). These benefits were also stressed by expert no.3 as part of this review.

The most significant costs to RMAs associated with public participation in land management include the transaction costs from co-ordinating multiple partners and engaging with new audiences (Waylen et al 2018). Additionally, from the interviews, expert no.2 stressed that the costs for RMAs also include time as a resource while ensuring policy engagement.

From the evidence, it is apparent that members of the public becoming involved in managing land is considered important for various reasons. The Stroud case study

(included in Burgess-Gamble et al, 2017) indicates that local people becoming involved in managing flood risk is necessary to protect and enhance their local environment. Participation and actions taken by landowners and farmers is particularly important for downstream communities and their businesses in their efforts to manage flood risk (Lavers and Charlesworth, 2018). In the literature, the involvement of farmers is considered vital, because poor land management may contribute to flooding. This makes it central to involve farmers and landowners in discussions on how to manage flood risk (Holstead et al 2017). Engaging local communities in developing BGI can also help to improve water quality (Everett and Lamond, 2018)

Involving members of the public in managing land to address flood risk is also seen as important in terms of having access to local knowledge gained from experience. In the context of FCERM in England, Mehring et al (2018) found that local residents believe that they often know more about local issues than the authorities. Including this local knowledge in the processes of land management to address flood risk is seen as important, as it will mean decisions will be accepted and delays in the implementation of FCERM measures avoided (Mehring et al 2018; Smith and Bond, 2018). This was also supported by expert no.2 as part of this review.

7.7 Conclusions and evidence gaps

The publications reviewed describe a range of activities involving natural and social scientists, RMAs, members of the public (for example, farmers, landowners, local members of the public) volunteering and/or acting together in groups as part of NFM.

This review found that previous personal experiences involving flooding events and dealings with flood risk experts are the main motivators for members of public to participate in implementing BGI. Sustained engagement in NFM appears to be difficult. The different facilitators and barriers to public participation in land management highlight the challenging nature of ensuring engagement among all members of local communities. The literature reviewed provides strong evidence on the individual/psychological and social/institutional barriers and facilitators to participation. Material barriers are mainly associated with the financial costs of participation. The workshop participants felt that a lot of existing evidence on this FCERM activity already exists. The benefits to communities and RMAs of members of the public participating in managing land appear to considerably outweigh the costs.

- From the papers reviewed it is evident that various governance and institutional arrangements that facilitate participation in managing land to achieve flood risk benefits are being discussed. Flooded communities believe that early engagement and the collaborative gathering and production of knowledge is key to building trust and creating more robust partnerships with flood authorities. The different perspectives of members of the public and contexts on involvement with flood management presented in these studies call for diverse forms of engagement by the flood authorities to be successful. Not enough is known about whether there are generic perspectives common to all contexts. However, a toolkit of engagement strategies suitable for different perspectives and contexts appears to be missing.

This review identified that there are very few studies related to farmers' decision making on NFM schemes. Similarly, there is little understanding on the public's preferences of available BGI measures and their perception on the costs and benefits (Everett and Lamond, 2013). Better understanding around the normalisation of BGI, how long this takes and how it can be encouraged would be welcomed (Everett and Lamond, 2014). From the interviews, expert no.2 noted that a better understanding of how to introduce and communicate uncertainty in the context of BGI is needed.

The workshop participants suggested that there is a lack of evidence on the complexities of engaging upstream and downstream communities as current literature views them separately. Other issues that need examining further include:

- understanding the threshold of behaviour change for land managers
- ways to achieve effective communication with land managers on NFM as a measure that won't stop flooding
- realising the spectrum of BGI options in urban environments

More comparative studies in water management are needed to know how to tackle legacy 'lock-ins' that impede new approaches on NFM. Evidence on how these issues can be tackled to achieve the recognition and re-examination of views and expectations among those engaged in FCERM appears to be poorly understood. The workshop participants advised that evidence could be drawn from behaviour change literature to answer some of these questions. In addition, more needs to be understood about the tools and approaches that flood authorities need in order to help engage and work with farmers and landowners (Boeuf and Fritsch, 2016).

8 Preparing and adapting homes to reduce flood impacts

Key findings:

There are individual (for example, emotional) and social barriers and facilitators that affect how householders engage with property flood resilience (PFR). These include links between negative emotions and taking protective actions.

There is some evidence of demographics influencing who participates in PFR (for example, older and younger, better off, more educated, but not a consensus across the evidence).

There are higher levels of awareness and uptake of PFR among people affected by flooding, but still quite low levels of awareness in general.

Reinstating homes so they are designed to be resilient after a flood is hindered by the fragmented nature of the recovery process.

Evaluation of PFR schemes shows the role of taking a group/community approach, and how it can improve community capital and maintenance of PFR measures. Linking PFR schemes into community emergency plans and regularly exercising them were keys to success.

There has been some analysis that shows that having insurance in place that values PFR could improve uptake.

8.1 Introduction

This chapter is focused on property flood resilience (PFR), the measures that communities and individuals can put in place to reduce the impacts of floods. It focuses on the ways in which properties might be protected and/or adapted to cope with flood water and is used as an umbrella term to include measures to keep water out of properties as well as measures to minimise the impact of water entering a property. Defra (2019) says that PFR aims:

> *"To make people and their property more resilient to the physical and health impacts of flooding. It prevents water entering a property or minimises the impact if water does enter. Terms often used in property-level flood protection and flood resilience include the following:*
>
> - resistance (keeping water out of the property)
> - resilience (minimising the damage caused by flood water entering a property)

- adaptation (changing an existing property so that it is more resistant/resilient to floods)
- active (manually operated - a flood resistance/resilience measure that requires action to set it up in advance of flooding, for example, a flood barrier)
- passive (automatically operated - a resistance/resilience measure that is always in place or automatically activates before or during a flood)" (Defra, 2019, para 1.2)

Different papers use different terms for the PFR measures they have examined (for example, property level protection, flood proofing, and property resistance). PFR is an area that has had a government focus over recent years, specifically through the Bonfield Roundtable that produced a Property Level Resilience Action Plan in 2016 (Defra, 2016). This led to further research (for example, Defra's Property Flood Resilience Pathfinder project, 2019) and development of good practice guidance (for example, CIRIA Code of Practice and guidance for property flood resilience, 2020)

In this chapter, engagement around PFR by individual members of the public and groups centres around their uptake of measures as well as their engagement in decisions about the uptake of PFR.

Overview of the literature

This chapter focuses on 11 papers (see Appendix B), which included 1 review paper and 10 empirical papers (3 quantitative, 6 qualitative and one mixed method). 4 of the papers were grey literature: Defra/ Environment Agency funded research, with the rest being academic papers. All studies were from the UK apart from one, which was a comparative study across the Netherlands, Belgium, France and England (Suykens et al, 2016).

In terms of sample sizes, the quantitative surveys were between 44 and 2,109, while the qualitative interview samples ranged between 27 and 30 (although one did not reveal the number of interviews carried out). The mixed method study included focus groups (Owusu et al, 2015). Seven of the empirical papers surveyed or interviewed members of the public. Two also surveyed or interviewed relevant interested groups and key professionals (for example, surveyors and builders) involved in providing PFR (Defra, 2014). Three studies examined the engagement of individual members of the public and groups indirectly through interviews with interested groups involved in the policy process (Suykens et al, 2016) and project managers of schemes (Twigger-Ross et al, 2015; Defra, 2014; Orr et al, 2016).

Key topics explored by papers include:

- barriers and facilitators to the uptake of PFR during the recovery process, looking at the process of reinstatement from the different perspectives of the people involved in that process (Lamond et al, 2019)
- individual (for example, emotional) and social barriers and facilitators for engagement with PFR by householders (Harries, 2012, Lamond et al, 2019; Owusu et al, 2015; Soane et al, 2010)
- levels of awareness and uptake of PFR among people affected by flooding (Joseph et al, 2014)
- evaluation of PFR schemes (Harries, 2009; Defra, 2014)
- assessment of current practice and suggestions to increase uptake of PFR (Defra, 2016)

- analysis of how recovery strategies might support mitigation strategies such as PFR (Sukyens et al, 2016)
- evaluation of the impact of infrastructure interventions on community resilience and the role of community capital in institutional resilience (Orr et al, 2016)

8.2 Extent and type of public participation

This section summarises the literature that was reviewed to answer the following research question:

RQ1. To what extent and in what ways are members of the public participating in preparing and changing their homes to reduce flood risk impacts?

From the papers reviewed, a key point made by both Harries (2012) and Joseph et al (2014) is the low uptake of PFR measures by those who have been flooded, although it is still greater than by those who are at risk but have not been flooded (Harries, 2012).

> "*In 2004 to 2005, 6% of risk-aware, unflooded households and 39% of previously flooded households had taken steps to increase their resilience to flooding (Harries, 2008a), and by 2008 the equivalent figures remained almost unchanged at 9% and 34%, respectively (Thurston et al, 2008*)." (Harries, 2012. p.651).

Joseph et al (2014) indicate that 82% of their sample who had been flooded in 2007 (280 people from a range of flooded locations across England) were returned to their pre-flood state with no protective measures taken. As Soane et al (2010) stress:

> "*Flood experience is neither a necessary nor sufficient incentive for domestic flood protection."* (p. 3024).

Owusu et al (2015) in their study of flooded and at risk people in Scotland found a more optimistic situation. The majority (61%) of those who were aware of PFR had taken up some measures, with that group comprising those who had been flooded and those who had not. Evaluation of the 2009 to 2011 Defra Property Level Protection Schemes (cited in Defra, 2014) found that although awareness of PFR measures was low before the grant scheme, after effective community engagement, 90% of residents took up flood products offered. The studies reviewed cover a range of different PFR measures, including both resistance (water exclusion) and resilience (water entry) measures, making comparison of findings difficult.

Table 8.1 Types of PFR measures covered in the reviewed studies

PFR measures	Harries (2009)	Harries (2012)	Joseph et al, (2014)	Defra, (2014)	Owusu et al (2015)	Twigger-Ross et al (2015)	Soane et al (2016)	Orr et al (2016)
Resistant materials (for example, flooring concrete, floor tiles)			X	X	X			
Water resistant plaster, render, sealer	X			X			X	
Electrical socket and/or gas meter above flood line			X			X		X
Sandbags					X		X	

PFR measures	Harries (2009)	Harries (2012)	Joseph et al, (2014)	Defra, (2014)	Owusu et al (2015)	Twigger-Ross et al (2015)	Soane et al (2016)	Orr et al (2016)
Airbricks/vent covers		X			X		X	
Flood guards (doors/windows)	X	X		X	X	X	X	X
Free-standing barriers					X	X		X
Flood skirt			X		X			
Flood walls					X			
Water pump and sump system	X			X	X			
Plastic kitchen units, stainless steel kitchen units			X					
Tanking			X					
Water resistant paint			X					
uPVC doors			X					
Seals to prevent backflow from toilets							X	

Soane et al (2016) found in their survey that those who bought flood protection were younger, more educated and higher earners than those who did not. Owusu et al (2015) found that better off households with older, particularly retired, people, were more willing to contribute towards the cost of PFR. However, Harries (2012) found no correlation between protective behaviour and a number of other demographic variables, specifically, type of housing, tenure, household composition or employment status.

8.3 Barriers and facilitators

This section summarises the literature that was reviewed to answer the following research question:

RQ2. What are the barriers and facilitators to members of the public participating in preparing and changing their homes to reduce flood risk?

8.3.1 Individual/psychological barriers and facilitators

Joseph et al (2014) found awareness of PFR measures alone does not necessarily mean they will be implemented. Harries (2008, 2012 and 2018) has focused on the emotional and psychological factors involved with uptake or not of PFR among homeowners and SMEs. Harries (2012, p.662) found that "*risk perceptions and beliefs about the effects of protective action were significantly associated with protective behaviour.*" Specifically, the paper found that anticipated negative emotion associated with protection (in other words, thoughts about flooding) was linked to having taken protective action. Harries suggests that having visible protection reminds people of the fact that they could flood. This builds on previous work by Harries (2008) that provides a psychological explanation for why people may feel more secure by not taking action, denying the risk is a psychological coping mechanism. Studies of people recovering from flooding (for

example, Medd et al, 2015) show how signs such as rainfall can create anxiety in those who have been recently flooded.

Harries (2012) also found that behavioural norms (what others do or what is expected of you) did not have any relationship to taking protective actions. Also, a perception of the probability of flooding in the next 10 years was associated with increased protective action, and the likelihood of moving away from the area soon was associated with not taking action.

Evidence suggests that measures that let water into a building (water entry) have been shown to prevent some of the damage that occurs from floods (Rose et al, 2016), and for floods above 0.60m this is preferable to excluding water. Unsurprisingly, water exclusion approaches are preferred by householders and professionals (Rose et al, 2016). One of the expert interviewees (expert no. 7) suggested that people mainly want sandbags as they block obvious entry points, and that there is tendency to think about the short term rather than the longer term, for example, that water might come in via the toilets or that they could flood again. The disruption of a flood affects the idea of the home as a safe place (Sims et al, 2009). Understanding this in the context of uptake of water entry measures would benefit from further research.

Lamond et al (2019) examined where in a property's reinstatement process it might be possible to introduce the idea of resilience measures with a view to implementing them. Interviews were carried out with professionals, together with case studies involving homeowners who had considered resilience measures to identify the barriers and facilitators to uptake. The case study interviews highlighted:

> *"the emotional turbulence experienced by policyholders after a flood event. These emotional impacts sometimes overshadow the material aspects of flooding, making it harder for them to focus on practical issues such as resilience and focusing their attention on the re-establishment of a state of emotional normality." (see Lazarus and Folkman, 1984)*
>
> *"the timing, content and delivery mode of communications about resilience need to take this into account."* (Lamond et al, 2019, p.36)

This highlights the emotional aspects associated with flooding and how it affects the decision individual members of the public and groups make around PFR.

Soane et al (2010) found in their study that:

> "*participants purchased flood protection devices when they perceived the flood risk to be serious and critically they had a sense of responsibility and agency*." (p. 3035)

People need to believe that they can take action and that the actions they take will be effective (expert no 6). Understanding how this sense of responsibility and agency (feeling of control) develops is a key aspect for further research. This was something that the workshop participants felt was important to understand: how perceptions of who is responsible for protecting properties (particularly in rented properties and businesses) affect the uptake and effectiveness of measures, and what should owners, buyers and renters be told about flood risk and their roles and responsibilities?

Furthermore, self-image or identity can be a barrier to uptake. Small business owners who pride themselves on being able to 'duck and dive' may well find it hard to ask for help or plan for a flood (expert no.7). How people perceive themselves impacts on behaviours, and this is another interesting area for further work.

8.3.2 Social/institutional barriers and facilitators

Several papers show how having a community approach to implementing PFR can affect a scheme's success. There were greater levels of awareness of PFR in the border town of Hawick, Scotland, which was attributed to the work of the local community flood group (Owusu et al, 2015). Harries (2009) in evaluating a pilot scheme for Appleby-in-Westmorland identified how the approach taken by the Environment Agency encouraged a collective response, looking across the whole village and asking what could be done to help reduce the flooding. This led to some individual PFR, but also some community PFR (for example, a wall in front of a number properties, together with a series of demountable aluminium flood barriers were installed to block access points for pedestrians and delivery vehicles, and a pump was provided for pumping out water). Harries (2009) found that collective implementation:

- encouraged collaboration between residents, more effectively protecting mansion blocks and homes with party walls
- "fostered a greater sense of local solidarity" (Harries, 2009, p.iv), as did including businesses as well as residents in the scheme
- acted as a catalyst for the development of a town flood plan
- ended up with local leaders being considered by the Environment Agency as part of their emergency response, making the town less dependent on external support during flooding

Expert interviewee no.7 found that uniting around a common goal had overcome differences between SMEs. After the 2012 floods, Defra (2014) carried out an evaluation of the 2011 PFR scheme to look at its effectiveness. It returned to Appleby to see how the scheme was working and concluded that having a full package of measures supported by a flood group and multi-agency working were key success factors:

> *"The examples of where property level protection has been successful, such as seen in Appleby, serve to illustrate what can be achieved by fully engaged communities with a comprehensive package of property level protection measures, with operational details described in effective emergency response plans, supported by regular flood group meetings and integrated multi-agency working.*" (Defra, 2014, p. iv)

Part of that package involved effectively trialling the measures through exercises, which was another success factor:

> *"In Alconbury and Alconbury Weston it was reported that such a trial raised confidence in the measures to the extent that sandbags were not requested for the villages: a usual precautionary measure prior to the installation of the property level protection measures."* (Defra, 2014 p.14)

> *"The dry runs have been especially useful for establishing how long it takes for the property level protection measures to be comfortably installed, following an alert (around ¾ of an hour), and to keep residents 'on their toes,' providing an opportunity for residents to check their equipment and if it is being stored correctly, and practice installation. The dry runs have also been useful to educate new tenants of the village's rented property in how to install their measures."* (Defra 2014, p.36)

Professionals suggest that unless people practice using their PFR every year it gets put away into the garage and forgotten (expert no. 6).

Harries (2009), Twigger-Ross et al (2015) and Orr et al (2016) all provide further evidence of the value in implementing a PFR scheme collectively rather than individually. Drawing out key aspects of that collective implementation, Harries (2009) highlighted the presence of key community leaders as well as clear social networks among local people as being important (known as 'social' or 'community capital'). Orr et al (2016) identified the challenge of encouraging uptake in areas of low levels of community capital. They show how engagement with individuals in an area with high levels of rented properties and low community capital made it very difficult to implement a scheme. By contrast, in areas where there were existing networks to link into or effort was put into developing a group, the uptake of the PFR and collective solutions, where appropriate, was successful.

> "*Having a flood group helped in a number of pathfinders to support the uptake of property-level resilience measures."* (Orr et al, 2015, p.7)

A well-developed community emergency flood plan was a key part of the implementation of the PFR scheme at a collective level (Defra, 2014). Such a plan formalises the relationships between people so that it is clear who does what in an emergency.

Further factors influencing the success of the implementation of the pilot scheme in Appleby were how receptive the local people were to the idea of a pilot scheme given their history of flooding, together with a community sense of pride in their ability to survive the floods. This identification as people who are good at coping with flooding can be thought of as a social identity, and identification with a specific group has been shown to increase collective action during emergencies (Drury et al, 2019).

8.3.3 Material barriers and facilitators

The costs associated with PFR have been raised as a potential barrier to uptake for individuals. Lamond et al (2016) carried out a project to demonstrate what low cost options might be available to householders to encourage uptake of resilience measures. Joseph et al (2014) found that cheaper resilience measures were carried out more frequently than the higher cost measures during reinstatement after the 2007 floods. They conclude that financial constraints might be one barrier among a number that prevent uptake (Joseph et al, 2014). Having measures that are cost neutral during reinstatement (for example, replacing electrical sockets with ones further up the wall) could be a facilitator with respect to the insurance industry. The insurance company would not have to spend more money than they would usually in putting a house 'back to normal'. However, Lamond et al (2019) considered how the governance of the reinstatement process and its lack of standards and consistency make that more problematic (see section 8.6).

Financing can help facilitate the uptake of PFR (Harries, 2009). However, financial support alone is not generally considered to be enough to encourage people to take up PFR measures.

Orr et al (2016) found that areas where there were high numbers of rental properties together with shift working patterns made implementing PFR schemes difficult. The case study (Slough) identified the following challenges: language barriers, cultural challenges, priorities and shift work, property ownership, financial implications. Table 8.2 provides more detail on those challenges.

Table 8.2 Challenges to implementing PFR scheme in areas of high rental properties (from Orr et al, 2016)

Language barrier	Residents unable to read initial letters Residents unable to communicate on doorstep
Cultural challenges	Challenge engaging with lone female residents in some cultures Female residents keen to have surveys but not when husband not present
Priorities and shift work	Residents reluctant to take time off work for surveys Residents do not know times they are available in advance Residents rarely available during standard hours for engagement
Property ownership	Residents do not feel responsible for council or rental properties
Financial implications	Residents suspicious of project activity and assume they are being sold products especially when they have not experienced flooding first hand
Other challenges	Residents unwilling to work with council directly for fear of consequences, for example, reporting illegally constructed buildings or multiple occupancies

8.4 Approaches and models

This section summarises the literature that was reviewed to answer the following research question:

RQ3. What approaches/models of participation encourage/discourage members of the public from participating in preparing and changing their homes to reduce flood risk impacts?

Defra (2014) highlights early engagement where residents are shown the types of measures that are on offer for their area as a positive approach to encouraging uptake. This is the approach that the National Flood Forum (NFF) encourages, with the scheme provider being responsible for providing information. The NFF has an information trailer, which it has used on numerous occasions to help inform and advise on the PFR options available to people who have been flooded or are at risk of flooding. The NFF advises having this available after a survey has been carried out as well so that residents can have a more informed look at what their PFR options might look and feel like. Defra (2014) suggests that:

> *"Successful property level protection schemes require a combination of technical and behavioural factors to work together: independent and comprehensive property surveys are an essential prerequisite, followed by well designed and installed flood protection measures; while homeowners and communities need to have a clear understanding of their responsibilities to store and maintain their measures, together with emergency plans for their timely and effective installation."* (Defra, 2014, p.3)

To be most effective, Defra (2014) and Orr et al (2016) encourage a collaborative approach between RMAs and local residents, suggesting the value of a flood group being involved. RMAs spending time listening and empathising with communities builds trust and facilitates that collaborative working (expert no.7).

In an evaluation of Defra's Flood Resilience Community Pathfinders project (Twigger-Ross et al, 2015; Orr et al, 2016) a multi-dimensional model which enables a proactive approach to community resilience was proposed this built on the work of Cutter et al

(2014). Orr et al (2016) emphasise the links between PFR (infrastructure) and other resilience capacities, for example, community and institutional resilience. This means taking an approach that links the improvements made in PFR with a wider concept of community resilience: showing how implementing PFR at the community or group (community capital) level can be more successful.

"Infrastructure often provided a focus for local people to come together and for coordination between authorities, agencies and citizens. The Pathfinder scheme provided valuable learning on the synergies between action to build relationships….and practical measures to install or improve community infrastructure." (Orr et al, 2016 p.8)

With respect to practical guidance summarising its approach, Defra (2014) provides a useful diagram to illustrate a best practice approach to implementing a PFR scheme within a local community. This goes from the initial appraisal of eligibility for the PFR through to installation. Importantly, it links it into a community flood plan and highlights testing the plan each year. Having individual measures linked into a formal plan and testing should make sure that any temporary measures are correctly installed as well as highlighting any challenges with their installation.

Defra (2014) provides some 'best practice' guidance on engagement that summarises RMAs' successful approach to implementing PFR schemes:

> *"Many residents may not have experienced previous floods. Residents should be encouraged to work within their communities to share resources, experience and knowledge. Use local resources to help them understand the context better.*
>
> *Ensure the product is appropriate for both the property and for the resident.*
>
> *Be clear with residents about what is feasible with the funding available. Explain that expenditure over allocated grant will need to be topped up by contributions from residents or other sources.*
>
> *Be clear that residents own their Property Level Protection measures, that they are responsible for deploying their Property Level Protection measures and should plan how to do this. Property Level Protection measures will require regular checks and maintenance.*
>
> *Be clear on the benefits or effectiveness of Property Level Protection to residents.*
>
> *Residents should be aware of the height limit of the Property Level Protection supplied and that where the flood water level is above this, Property Level Protection will not give protection.*
>
> *Residents and installers should be encouraged to make the training as effective as possible. Consider a questionnaire with residents, post-installation to see if they feel adequately trained and retrain residents if necessary." (*Defra, 2014, p.40)

This guidance is still relevant and should be considered going forward in relation to implementing RMA PFR schemes. Figure 8.1 describes the steps and processes involvement in implementing PFR.

There are clear benefits (Joseph et al, 2014; Lamond et al, 2019) to installing, specifically resilience (water entry) measures during the period of reinstatement directly after a flood because the costs are lower, as the contractor's site set up is paid by the insurer as part of the normal insurance reinstatement work. Lamond et al (2019) found that there are a number of factors that make this challenging both at the individual level and at the level of governance. Recovery from flooding is an emotional rollercoaster, so introducing and

implementing new ideas (for example, resilient reinstatement) needs to be carried out in relationships of trust and empathy between professionals and policy holders (Lamond et al, 2019). Involving many different professionals leads to the implementation of PFR becoming fragmented. Current research (Environment Agency, 2019) evaluating the PFR Pathfinders should provide some useful insights into how these factors might be overcome.

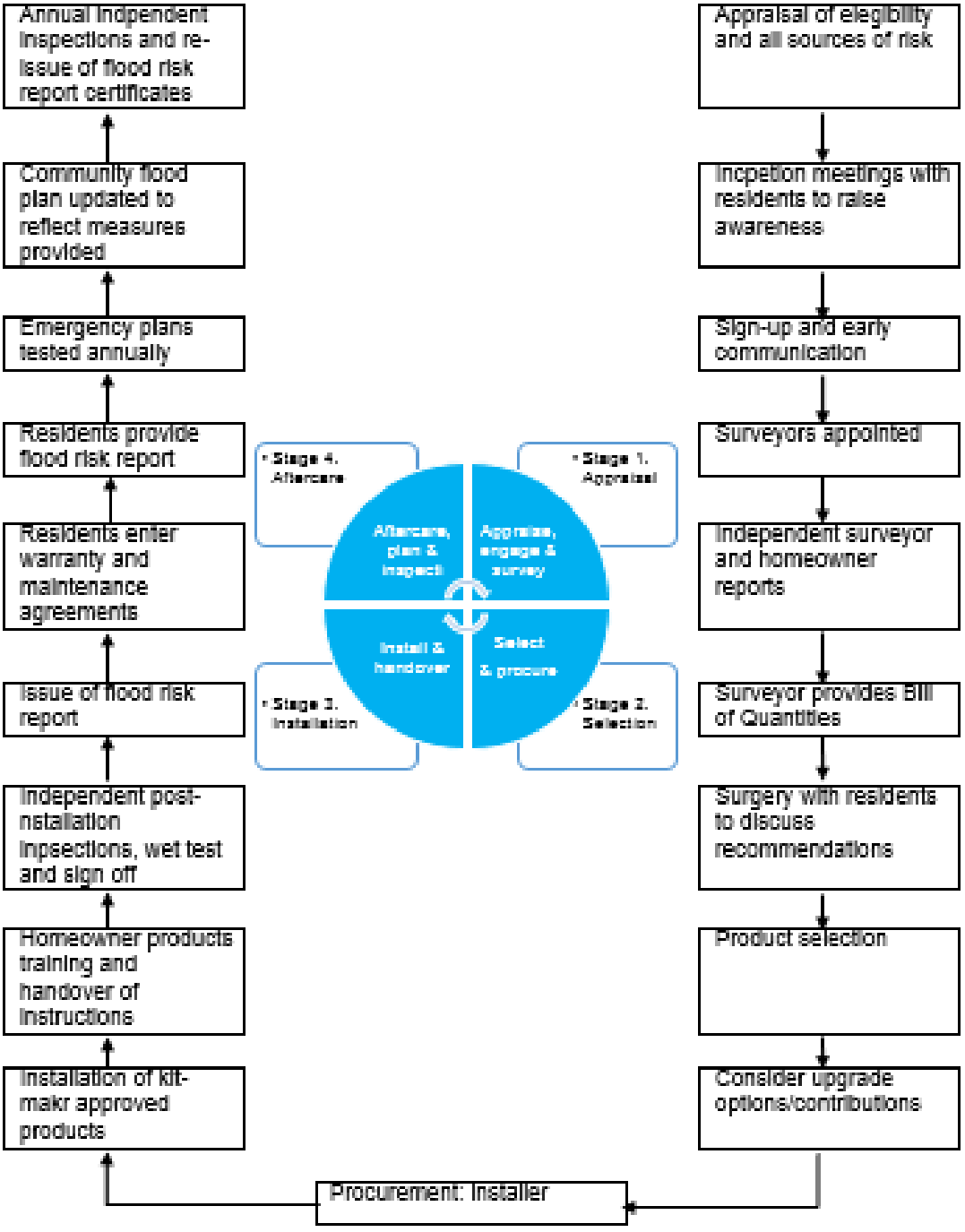

Figure 8.1 The steps and processes of implementing a property level protection scheme (Source: adapted from Defra, 2014)

8.5 Governance and institutional arrangements

This section summarises the literature that was reviewed to answer the following research question:

RQ4. What types of governance and institutional arrangements facilitate or inhibit members of the public's participation in preparing and changing their homes to reduce flood risk impacts?

There are some key factors in relation to governance and institutional arrangements that either facilitate or inhibit the uptake of PFR measures. Firstly, in practice there is not a clear relationship between PFR mitigation measures and insurance as a recovery measure within FCERM in England and Wales. Incentives to carry out PFR measures through the insurance system such as reduced premiums are not uniformly available.

> *"Currently, in England, Flood Re does not explicitly provide for mitigation measures as part of the insurance policy (Surminski and Eldridge 2014). Under both the pre–Flood Re approach and the new system, properties are, in theory, able to benefit via a premium reduction from flood proofing or other risk reduction measures. Whether a premium reduction is available, as well as what is included or excluded and the amount of any deductible, is at the discretion of the individual insurer. Evidence suggests, however, that the numbers of properties that have actually benefited in such a way is limited (Bell, 2011; Cobbing and Miller 2012)."* (Suykens et al, 2016 npn)

From their analysis, Suykens et al (2016) suggest possibilities for integration between the recovery strategy of insurance and mitigation strategies of PFR. These are described in Table 8.3 (adapted from Suykens et al, 2016).

Table 8.3 Relationship between recovery strategy (insurance) and mitigation strategy (PFR) (Source: adapted from Suykens et al, 2016)

Does the ex-post compensation mechanism (insurance – recovery strategy) incentivise individuals to take adaptive building measures and retrofitting in a structural manner (mitigation strategy)?		
Possibilities for facilitating linkages between strategies	Occurring in England (2016)?	Possible?
Participation in recovery mechanism (insurance) is based on prevention, defence, or mitigation measures	Generally, no	Yes, in principle insurers could require measures for insurability
Premiums take into account adaptive building measures	At discretion of insurer	Could be more widespread
Mechanism to ensure that compensation received following floods is used to retrofit building	Not present in the policy and currently not part of Flood Re	Repair and renew grants aimed to do this

The table shows the position in 2016 in England together with what is possible within the current governance system. It shows that there are a number of ways in which tighter links between providing insurance and encouraging PFR measures could be created.

Two further governance/institutional arrangement issues emerge from the literature:

- the nature of the reinstatement process and its impact on the ability to encourage uptake of resilient measures
- the nature of the local authority procurement process

Medd et al (2015) looked at the recovery process following the 2007 floods in Hull. They identified and documented the process for those who had been flooded during the rebuilding of their homes (using diaries and interview data from a group of flooded residents for a maximum of a year after the flood). It showed the recovery process involved many different professionals (for example, surveyors, loss adjustors, builders, insurers). Having to deal with many professionals, combined with a lack of clarity over responsibilities, was shown to be a key stress factor for those who had been flooded. Lamond et al's (2019) work reiterated this fragmentation among the professionals involved in the reinstatement process. A key finding from their Quick Scoping Review (QSR) and interviews with professionals was that:

> *"In many cases, the complexity in the number and range of professionals involved represents a potentially overwhelming situation for a policyholder. Whether or not they are managing the process, the policyholder may have to interact with a large number of individuals representing different companies. This confusion can be exacerbated when roles and responsibilities in the overall process vary between neighbours and between claims."* (Lamond et al, 2019, p.24 our emphases)

Introducing resilient reinstatement into an already complex situation is made harder by the fact that as the research found there is a "*lack of clarity and guidance in the expectations and processes with regard to resilient reinstatement between insurers and their professional supply chain."* (Lamond et al, 2019, p.28)

Secondly, there is evidence (Defra, 2014; Twigger-Ross et al, 2015) that local council procurement processes can take longer than anticipated, which can cause delays:

> *"Key findings from the 2011 Property Level Protection Grant Scheme Evaluation report identified that procurement was affected by resource issues and tight timescales, with Local Authority procurement issues sometimes causing problems and delays. This has since been borne out in local authority procurement, adopting the Government Procurement Service framework."* (Defra, 2014, p.15)

8.6 Costs and benefits

This section summarises the literature that was reviewed to answer the following research question:

RQ5. What are the costs and benefits (to communities and RMAs) of members of the public participating in preparing and changing their homes to reduce flood risk impacts?

The main benefit of participating in PFR should be increased resilience to flooding, specifically, the ability to recover quickly from a flood due to reduced damages to the property. This should lead to lower costs of recovery, a quicker return to daily routines and reduced psychological impacts (for example, stress and anxiety) associated with recovery (Medd et al, 2015). There is government and industry activity (for example, Bonfield Action Plan, 2016; Defra PFR Pathfinders, 2019) and a drive to increase uptake of PFR. However, there is a wide range of types of PFR and it is still a young industry. A code of practice (Kelly et al, 2019) was published in 2019 which provides guidance on the types of measures and their installation, but this will take time to filter down to all relevant professions. As a result, this can lead to a lack of clarity about what works in which situations and how that should be implemented. This is played out during the recovery process. Lamond et al (2019) highlight this in their case studies:

> *"Two of the case studies reveal the extent of the disagreements between professionals on issues of resilience. This is shown in disputes about the use*

of K11[8] (Case Study 1), over how to deal with an under-floor void (Case Study 1) and over when it is necessary to strip out flood-affected plaster (Case Study 2)." (Lamond et al, 2019, p.28)

The workshop participants also noted that PFR can exacerbate social inequalities as existing criteria for funding can mean that it doesn't always reach those in need.

The costs and benefits associated with members of the public participating in PFR can be split into 3 categories: psychological, social and financial.

8.6.1 Psychological costs and benefits

Participating in changing and adapting homes to increase resilience can be said to bring both psychological costs and benefits. As noted in section 8.3.1, there is evidence that some people experience increased anxiety after they have installed PFR measures. This is because they have accepted the risk of flooding with the installation of the measures as material manifestation of that acceptance (Harries, 2012). Understanding at what point the positive aspects of having the PFR, such as an increased feeling of security and being able to stay living in a beautiful environment, outweigh those negative psychological costs is still something to be researched (expert no. 7).

The need for policyholders to be proactive or 'pushy' in order to get PFR installed during reinstatement was recorded as a further psychological cost by Lamond et al (2019). Because of the fragmented nature of the recovery process together with the varied levels of PFR knowledge and skills across professionals, this can mean that policy holders are left to drive forward any PFR during reinstatement, which can add to the already stressful process of recovery.

8.6.2 Social costs and benefits

In terms of benefits, there are examples where the PFR scheme either provided a focus for a community group to develop (Orr et al, 2016; Twigger-Ross et al, 2015) or led to community groups and multi-agency meetings (Defra 2014). PFR schemes carried out at the community level do lead to actions in other areas of resilience, for example, development of community emergency plans and flood groups (institutional resilience, community capital) and discussion of wider FCERM measures (institutional, infrastructure). These, in turn, should help reduce damages and negative impacts on local economies, for example.

With respect to costs, Defra (2014) found that in one of its case studies, after installing PFR residents expressed a false sense of security, with an expectation that the measures could protect from all flooding. This highlighted the need to explain clearly the function and limitations of PFR measures to residents in the context of wider FCERM so that they still took appropriate actions during a flood. This links to concerns expressed by the National Flood Forum (Defra, 2014) that PFR needs be considered as part of a suite of FCERM measures, and not be seen as the cheapest and quickest solution for a community. In the interview with expert no. 5, it was commented that communities can feel that being offered PFR is a last resort and an indication that they are being abandoned by the RMAs. Clear guidance on the benefits and limitations of PFR need to be given together with its place within the wider FCERM context.

In its good practice guidance Defra (2014) reflect in the first step in its appraisal process:

[8] K11 is a generic term for salt resistant cementitious tanking compounds used for protecting structures against water from the ground and structures that may potentially be subject to hydrostatic pressure.

> *"The scope and suitability of a Property Level Protection scheme should be assessed as part of a wider appraisal of the hierarchy of all flood alleviation options, to confirm whether a community defence scheme can be progressed. Accelerating an early Property Level Protection scheme could detract benefits from a viable community defence unless these are agreed as interim measures."* (Defra, 2014, Annex A, p. III)

8.6.3 Material costs and benefits

Carrying out PFR during reinstatement can increase financial costs to the policy holder (Lamond et al, 2019), although in the long run the measures should reduce costs. For some builders, the costs were also seen to be too high. In addition, a cost is seen both in terms of the perceived extra time needed to get resilience measures in together with the actual time needed. Both of these aspects are reflected in the quote below:

> *"Likewise, both professionals and policyholders sometimes felt that attempts to introduce resilience measures would make the reinstatement process more fraught and delay its conclusion still further. For building contractors, this was seen as reducing profit margins to the point at which contracts became commercially untenable; for some policyholders, it was seen as extending the period of disruption for the sake of long-term benefits that might never be realised."* (Lamond et al, 2019, p. 37)

The importance of matching the products to the homeowners is stressed in Defra (2014) where it was found in one case study that some measures that had been implemented were inappropriate for the homeowners, for example, gates too heavy for the elderly to lift.

8.7 Conclusions and evidence gaps

The research reviewed here provides some clear conclusions about PFR and people participating in it and a solid foundation for future research and practice. There is a small but integrated body of work that has developed in the UK in this area.

Specifically, it is clear that there are complex and perhaps contradictory psychological processes at work in decisions to install PFR, linked to feelings of security and risk which need to be acknowledged. Understanding at what point the positive aspects of having the PFR, for example, an increased feeling of security or ability to stay living in a beautiful environment, outweigh the negative psychological costs such as being reminded that one is at risk, is something still to be researched. There is a need for further research to understand how the experience of flooding affects the idea of home as a safe place, in the context of the uptake of water entry measures.

With respect to governance issues there is evidence of fragmentation, lack of skills and knowledge among professionals such as builders and surveyors, both in and out of the recovery process, which is a barrier to successful engagement.

However, schemes that link up people in communities seem to be a way to improve the uptake and implementation of PFR, which provides further benefits to increase community resilience. Understanding how a sense of responsibility and agency develops among people living in flood risk areas is a key aspect for further research. People need to believe that they can take action and that the actions they take will be effective.

Workshop participants raised several questions that social research could help to address. For example, what are the factors that make property-level defences work (or not) and what are the behavioural aspects? How do perceptions of who is responsible for protecting properties (particularly in rented properties and businesses) affect the

uptake and effectiveness of measures, and what should owners, buyers and renters be told about flood risk and their roles and responsibilities?

The workshop participants raised a further interesting issue about the potential health and wellbeing impacts of installing PFR to individuals and communities. Are there psychological impacts of having to sustain property resilience measures over the long-term? This issue of long-term impacts of managing floods is an area of work that would also would interesting to examine. Some participants made suggestions of the kind of evidence that could help fill the gaps as set out in the questions above. These included quantified evidence of the long-term benefits of property level protection and developing a rating system for different measures or a property level resilience standard. Evidence on approaches to monitor and measure resilience and case studies on the performance of property level protection measures were also suggested.

9 Taking part in conversations about long-term adaptation

Key findings:

The main way communities engage in conversations about long-term adaptation is through their response to the development of FCERM strategies such as SMPs and local FRMPs.

Those who have a greater stake in the local community are more likely to engage in long-term adaptation measures and decision-making.

Prior experience of flooding, place connection, and knowledge of future risks all impact the 'readiness' of communities to engage in conversations about long-term adaptation.

People are more likely to adapt to coastal change if they have the awareness, knowledge, skills and experience to engage with the technical aspects of adaptation measures.

In Wales, the Well-being of Future Generations (Wales) Act 2015 provides a framework for governance, including how public bodies such as FCERM authorities engage with members of the public in long-term decision making.

Ongoing engagement that starts early and is accessible, inclusive and interactive so that communities are listened to rather than just being told information encourages greater public participation in conversations about long-term adaptation (for example, Defra Community Pathfinder schemes).

Public participation enhances capacity for collaborative decision-making in long-term FCERM. However, in places where there are underlying socio-economic issues, these can make adaptation options unacceptable to communities. High levels of public participation where communities drive the decision-making process for FCERM strategies can lead to unfavourable mitigation options being preferred over adaptation measures.

9.1 Introduction

This chapter covers long-term adaptation, specifically related to coastal erosion and sea level rise. It also includes the development of FCERM strategies such as SMPs and FRMPs and focuses on how communities are engaging with the development and implementation of these strategies.

Overview of the literature

This chapter focuses on 13 documents (7 peer reviewed papers and 6 grey literature documents). Of the reviewed documents, 3 were reviews and 10 were empirical studies. Of the empirical studies one was quantitative, 6 were qualitative and 3 used a mixed method.

9.2 Extent and type of public participation

This section summarises the literature that was reviewed to answer the following research question:

RQ1. To what extent and in what ways are members of the public participating in conversations about long-term adaptation?

Moore and Davis (2015) reviewed policy guidance and approaches for the management of coastal erosion and flooding, particularly management of coastal land instability. They describe recent policy guidance for coastal cliffs in England and Wales and explored approaches to stakeholder engagement. One way that communities have engaged with coastal management projects is by providing funding (Moore and Davis, 2015). Local communities can also play a significant role in cliff instability and erosion management by implementing good practice of property maintenance, land management and carrying out regular inspections and monitoring. Residents can work together to make sure issues are reported and addressed. Alternatively, some activities by individual property owners were shown to adversely affect cliff stability (for example, clearing vegetation). Moore and Davis (2015) conclude that there is progressively a need for wider stakeholder engagement and that at a local level, communities and individuals that benefit from coastal protection measures will increasingly be under pressure to get involved and contribute financially, no longer relying on state intervention.

Another way in which local communities engage in conversations about long-term adaptation to flooding and coastal erosion at the coast is by forming coastal action groups (CAGs) made up of voluntary bodies and stakeholders (Famuditi et al, 2018). A qualitative study of 12 CAGs showed that although most CAGs started as a single-issue group, some had diversified into environmental justice groups that more generally promote fair distribution of environmental benefits and problems through various channels, specifically campaigning and direct action and sometimes through education and active partnerships with statutory authorities (Famuditi et al, 2018). CAGs relate to specific geographical locations and members are almost always local residents, especially those that have a stake in the community, for example homeowners and those engaged with local businesses. Groups were also generally made up of a mix of active members and ‘contributors’ who participate in less demanding activities such as signing petitions and making donations (Famuditi et al, 2018).

The 12 CAGs demonstrated 3 main priorities: to challenge specific local SMP policies, to secure greater participation in decision making, and to mobilise the local community and other interested groups to meet and discuss solutions to shoreline management issues. A number of campaign-related actions had commonly been used by CAGs, including writing letters of protest, offering interviews to local media, meeting and lobbying politicians, establishing a group website, organising meetings to discuss views and recruit new members, organising petitions and producing wearable campaign merchandise (Famuditi et al, 2018).

CAG members expressed various reasons for joining a group, such as having a broad concern for the local environment, the recreational opportunity, and concern for the interests of their community. Only a few participants in the study had experienced or were at imminent risk of erosion or flood loss themselves (Famuditi et al, 2018).

Expert participants at the 2020 workshop felt that within communities there are people with different levels of awareness; those that are engaged and aware and those who are

not engaged. Some participants questioned whether all communities want to be actively engaged or whether some would prefer to be listened to and offered solutions.

Another study looked at community driven coastal management in South Uist (Scottish Outer Hebrides) and assessed traditional integrated coastal zone management as a FCERM approach (Young et al, 2014). Since the 'Great Storm' in 2005, local communities have put great pressure on authorities to take action and erect structural coastal erosion management measures due to concerns about further erosion and loss of agricultural land in future storm events. This led to local people becoming key instigators of and participants in the consultation and subsequent coastal management programme. Since 2005, measures have been put in place to improve community resilience, including improving communication between local communities and authorities, community education on coastal processes, support networks to protect vulnerable individuals in future storms, and enhancing emergency services capabilities (Young et al, 2014).

Members of the public also participate in conversations about long-term adaptation when being consulted on lead local flood authorities' (LLFA) local FRMPs (Maiden et al, 2017) or in participatory planning of flood maps (Priest and Pardoe, 2012). The former is mostly done online, often via council websites, but other approaches are outlined in section 9.4. The latter, by providing 'expert' knowledge to improve or verify the content of maps (Priest and Pardoe, 2012). Public 'experts' have built up their knowledge through personal experience, not necessarily through experience of flooding, but they may have witnessed flooding or lived in an area for many years and developed an understanding of the mechanisms of flooding in that area (Priest and Pardoe, 2012). Therefore, their participation in workshops along with professional experts is used in developing maps.

Participants in the March workshop raised several questions about how to get people engaged with conversations around long-term adaptation, which they felt needed to be addressed. For example, how to engage communities around other peoples' risk when they are not directly affected, or how to engage communities where there is apathy.

Questions were also raised around promoting a focus on resilience. For example: What does resilience mean for different interested groups and how to address differences in perspectives? What needs to change so we develop schemes based on 'resilience' rather than protection? What can we do to help people and communities take actions to become more resilient?

Another gap in evidence raised by participants of the workshop was how to communicate climate change uncertainty and adaptive strategies without making people/communities feel that it means climate change isn't really happening.

Participants mentioned the following types of evidence that are needed to answer these questions: evidence about the benefits to communities of participation; what successful tools already exist; development of wellbeing metrics; long-term studies to explore the results of measures taken; development, sharing and combining community narratives.

9.3 Barriers and facilitators

This section summarises the literature that was reviewed to answer the following research question:

RQ2. What are the barriers and facilitators to members of the public participating in conversations about long-term adaptation?

9.3.1 Individual and psychological barriers and facilitators

In an evaluation of Coastal Change Pathfinder projects, it was found that feelings of complacency were a barrier to community engagement in rollback and leaseback schemes (Fenn et al, 2015). Kelly and Kelly (2019) use the term 'readiness' to describe the extent to which communities are psychologically prepared to engage in conversations about adaptation. Prior experiences of flooding and recovery, connection to place/place attachment, and knowledge of future risk contribute to complex feelings that can influence peoples' responses to information about flood and coastal erosion risk and therefore need to be considered (Kelly and Kelly, 2019).

Communicating risk can increase anxieties and feelings of helplessness, which, in turn, can increase the need to blame someone (Speller, 2005; National Flood Forum and Collingwood Environmental Planning, 2018; Singh Mehmi and Bailey, 2018 cited by Kelly and Kelly, 2019). According to expert no.1 interviewed as part of this current research, when engaging communities in conversations about long-term adaptation, people often have anxieties and awareness of potential negative futures.

9.3.2 Social and institutional barriers

A number of social barriers to public participation in conversations about long-term adaptation are identified in the reviewed literature:

- Recent experience of flooding causes emotions to be heightened, which can make engagement more challenging (National Flood Forum and Collingwood Environmental Planning 2018 cited by Kelly and Kelly, 2019).
- Often only the views of a few vocal members of a community are represented in public consultations and engagements, not the community as a whole (Fenn et al, 2015). Additionally, different levels of knowledge, time, interest and capacity make inclusive engagement difficult and existing disadvantages or levels of social exclusion can hinder participation (Kelly and Kelly, 2019).
- The need to 'adapt' and 'change' is often not well understood at the local level (Fernández-Bilbao et al, 2009). Raising interest and awareness of cliff instability and erosion management with local communities can be hard when there is little knowledge of the history or extent of the instability problem or about potential impacts of climate change (Cole and Davis, 2002; McInnes and Moore, 2011 cited by Moore and Davis, 2015). Options for recovery and adaptation can often be technically or legally complex and/or controversial (Kelly and Kelly, 2019). Similarly, confusing terminology used to describe risk (such as 1 in 20 years, 1 in 50 years) was reported by LLFAs as a barrier to engaging communities, especially with recent weather patterns over the last few years (Maiden et al, 2017).
- Lack of trust in risk management authorities can be a barrier to engagement (Kelly and Kelly, 2019; Fernández-Bilbao et al, 2009). This trust can be affected by experiences of flooding or of previously challenging decision-making processes (Kelly and Kelly, 2019).
- According to some LLFA stakeholders, the current public expectation that risk management authorities will deal with all flood risk is a barrier to engagement. Instead, there needs to be shift in expectations to a sense that the public themselves have a key role to play (Maiden et al, 2017). Such a shift is thought to require more intensive resilience building efforts that is currently required under the Flood and Water Management Act (Maiden et al, 2017).

Institutional barriers to public participation in conversations about long-term adaption include:

- complexity, fragmentation and inefficiency of FCERM structures (Kelly and Kelly, 2019). The complexity of planning processes and strategies that affect the coast, and the large number of organisations with responsibilities, can cause confusion in communities (Fernández-Bilbao et al, 2009; Bennett-Lloyd et al, 2019). Furthermore, the large number of organisations involved in decision-making can lead to a lack of leadership on coastal issues (Fernández-Bilbao et al, 2009)
- internal barriers within management authorities relating to the size, complexity of roles and cultures of the organisation (Kelly and Kelly, 2019)
- the current top-down decision-making structure (Fernández-Bilbao et al, 2009).
- there are also challenges around knowing the appropriate scale to engage at. There is increasing recognition within agencies of the benefits of catchment level management for adaptation to flood risk rather than individual communities. However, applying whole catchment thinking to engagement with communities living within the catchment is more challenging (Kelly and Kelly, 2019).

9.3.3 Material barriers

There is no statutory right to protection from flooding or coastal erosion, nor is there any clear funding mechanism to facilitate relocation, resilience measures or compensation (Defra 2012a, 2012b cited by Kelly and Kelly, 2019). Therefore, this can be a barrier to engaging communities in discussion about adaptation as some potential adaptation options are not fully legislated for or funded. Financial constraints are also a reported barrier to community relocation as an adaptation measure in some places (Fenn et al, 2015). This was the case for communities at Corton, Waveney, however complacency from the community was also reported to be a factor in why relocation did not happen (Fenn et al, 2015).

A lack of necessary skills and resources to facilitate engagement was also reported to be a barrier for community engagement in adaptation planning at the coast (Fernández-Bilbao et al, 2009). Public engagement is resource intensive, and time and resource availability is often finite, with competition between management authorities (Kelly and Kelly, 2019). The issue of resourcing may be particularly significant for smaller rural local authorities or for those that may only have a small stretch of coast (Fernández-Bilbao et al, 2009).

9.3.4 Facilitators of community engagement

There are potential facilitators and opportunities for engaging members of the public in conversations about long-term adaptation to flooding and coastal change, for example:

- The existence of already formed pressure groups was found to help with engagement in Pathfinder projects by providing readily identifiable groups of people (Fenn et al, 2015). CAGs are a way for members of communities to engage with decision-making about SMPs (Famuditi et al, 2018). The size of a CAG in terms of number of members had an impact on engagement; larger CAG membership size was considered to be beneficial for group activities, for example fundraising, lobbying and for sustaining highly active groups. However, larger group sizes generate requirements for administration and for regular events to maintain interest and avoid members becoming inactive (Famuditi et al, 2018).
- People are more likely to adapt to coastal change if they have the awareness, knowledge, skills and experience to engage with the technical aspects of adaptation measures (Fernández-Bilbao et al, 2009).

- There is typically little public re-engagement with flood maps in England and Wales, and little publicity on changes. Updating flood maps is suggested to provide a good opportunity to engage with professionals and the public (Priest and Pardoe, 2012).
- Using independent facilitators or brokers in engagement activities could help overcome the lack of trust in authorities (Fernández-Bilbao et al, 2009).

9.4 Approaches and models for engagement

This section summarises the literature that was reviewed to answer the following research question:

RQ3. What approaches/models of participation encourage/discourage members of the public participating in conversations about long-term adaptation?

A review of arrangements to manage local flood risk in England after the introduction of the Flood and Water Management Act 2010 (FWMA) found that most LLFAs have consulted the public on their FRMPs and more than half have carried out other communications or consultancy activity, however these have had limited traction (Maiden et al, 2017). In an assessment of 43 LLFA local flood risk management strategies in England, Benson et al (2018) also found that most LLFAs did not make significant engagement efforts.

LLFAs who consulted the public when preparing their local flood risk management strategies tended to do so online, often via the council website where the public could comment (Maiden et al, 2017). In some cases, the public were also consulted through surveys sent out to residents or published in parish newsletters or via social media. Post-draft consultation approaches included public meetings, road shows, approaches to parish councils, leaflet drops, surveys sent to businesses and residents (particularly in areas recently affected by flooding), stands at public events or fairs, and use of local radio (Maiden et al, 2017). However, the Defra (2017) report shows that these consultation activities have not been widely supported, and interested groups felt that more intensive localised community resilience work (for example, Defra Community Pathfinder schemes) has had more success in this area.

Similarly, Benson et al (2018) found that while some authorities produced high quality strategies, for many it appeared as a 'tick-box' exercise, with strategies themselves being inadequate mechanisms to communicate flood risk to the public. Some examples of successful and innovative approaches did encourage public engagement. For example, communication was most successful where strategies were produced in a non-technical way, using maps, photographs and case studies to improve accessibility, and made publicly available for free via different media, including meetings (Benson et al, 2018).

Kelly and Kelly (2019) explore a number of engagement approaches and practices. For example, role play or simulations are considered positive in terms of giving participants empathy and insight into the views of others and building collaborative capacity. The drawbacks of role play as an engagement approach are the costs in terms of facilitation resources and time required from participants, resistance to the idea of game playing among some interested groups and uncertainty of the outcomes, which are dependent to a great extent on what participants put into the process. Overall, Kelly and Kelly (2019) comment that role playing or simulation should not be seen as a stand-alone activity but as one element of an engagement process. During interviews, expert no.1 and expert no.4 both spoke about using role playing activities as a way to engage with the public about long-term adaptation. Expert no.4 also noted that although academic researchers promote the use of simulations, in practice people are often not so happy about getting

involved and facilitators are often faced with scepticism from interested groups about new approaches.

Other approaches that Kelly and Kelly (2019) identify as positive for public participation include:

- tools that help interested groups visualise future scenarios for their areas, giving them a clearer sense of the challenges and potential responses
- approaches based on recognising the roles that narratives and stories play in the lives of individuals and communities
- conflict analysis tools that could be used to deepen an understanding of actual and potential conflict dynamics
- approaches such as public education, debate and co-production of knowledge to address knowledge politics, particularly in the event of 'knowledge controversies' in which *"the claims and technologies of environmental science, and the regulatory and policy practices of agencies that they inform become subject to public interrogation and dispute*." (Whatmore 2009, p.588)

Cliff instability and erosion risk management is shown to only be effectively addressed through strong ongoing communication with local populations (Davis and Coles, 2005 cited by Moore and Davis, 2015). One way to achieve this may be through exhibitions that explain the causes and history of the instability problem and the publication of non-technical advice and guidance (McInnes and Moore, 2011 cited by Moore and Davis, 2015).

Young et al (2014) studied the integrated coastal zone management process at Kilpheder and showed it to be an example of highly inclusive engagement, with all interested groups participating. The educational nature of workshops and lectures given to communities by the CoastAdapt project[9] led to some favourable coastal zone management decisions at Kilpheder, including local communities agreeing to stop sand and shingle extraction and instead adopt soft coastal erosion management measures, such as erecting fishing net sand traps and planting marram grass (Young et al, 2014).

In Fairbourne, a village in the ward of Arthog in Gwynedd (Wales), public consultations were carried out when developing the second round of SMPs. However, the strategic nature of the plan meant that effective local dialogue, local influence of outcomes or examination of implications arising from the policies at local level was challenging (Bennett-Lloyd et al, 2019). Interested groups perceived a lack of coherence in the planning and implementation of public and stakeholder engagement at the strategic plan preparation level. At the public and community level in particular, there is little evidence of effective or well-planned communication/discussion during the framing of the plan's objectives or development of its content (Bennett-Lloyd et al, 2019). The focus on consultation and limited capacity for engagement in the preparation phase of SMP2 impacted on the delivery phase in terms of community and stakeholder knowledge and understanding of the content, function and status of the SMP2. Therefore, shifting engagement resources towards the beginning of the planning process may have saved time in the later stages (Bennett-Lloyd et al, 2019).

In areas where SMPs recommend a policy of managed realignment of defences or no active intervention, activities carried out throughout Pathfinder projects with the aim of raising community awareness, perception and interest in coastal erosion risks included mostly workshops (Fenn et al, 2015). Other activities included sending letters to property owners, holding open meetings, drop-in sessions, exhibitions, and one-to-one

[9] A ClimateAdapt project (Climate Adapt Project webpsite), CoastAdapt is a transnational project that is responsible for facilitating community adaptation to coastal change at Kilpheder (Young et al, 2014).

engagement, the latter of which was considered very effective in the East Riding of Yorkshire and North Norfolk (Fenn et al, 2015).

9.5 Governance and institutional arrangements

This section summarises the literature that was reviewed to answer the following research question:

RQ4. What types of governance and institutional arrangements facilitate or inhibit members of the public's participation in conversations about long-term adaptation?

In an exploration of integrated and adaptive management, Fritsch (2017) studied the role of the Water Framework Directive and the Floods Directive in encouraging public participation in FCERM in England and Wales. Both Directives rely on mandated participatory planning, which include 3 components: information, consultation and active involvement (Fritsch, 2017). Information requirements mainly include obligations to make available status and risk assessments, background information, and maps (Fritsch, 2017). Consultation requirements of the Water Framework Directive are that member states must organise 3 rounds of public comment when preparing river basin management plans. In contrast, the Floods Directive does not include consultations but opportunities exist through the Strategic Environmental Assessment Directive (Frisch, 2017). In terms of active involvement, the Water Framework Directive instructs that *"Member States shall encourage the active involvement of all interested parties in the implementation of this Directive, in particular in the production, review and updating of the river basin management plans*."(p.16) (similarly Art. 10(2) FD, p.6). Frisch (2017) observes that the phrase 'shall encourage' weakens the legal binding of the provision and falls short of a duty to ensure that this actually occurs. This therefore means that active involvement in England and Wales is not a legal requirement set by the British legislator but a voluntary decision made by the Environment Agency (Fritsch, 2017).

Under the Flood and Water Management Act 2010, LLFAs in England 'must develop, maintain, apply and monitor a strategy for local flood risk management in its area' (UK Government, 2010: Section 9(1), p.7 cited in Benson et al 2018). This is intended to balance national FCERM policy objectives with local level control. Strategies must incorporate specific requirements, including that they must be prepared in consultation with other risk management authorities (RMAs) and the public (Benson et al, 2018). In an assessment of 43 LLFA flood risk management strategies, Benson et al (2018) found that strategies generally provided good information about consultations with other RMAs but not the public. Furthermore, the level of detail about public consultation varied dramatically between different LLFA strategies (Benson et al, 2018).

In terms of coastal risk management, there are 15 Coastal Change Pathfinder authorities who work with local communities to pilot new approaches to planning for and managing coastal change (Priest and Pardoe, 2012 cited by Moore and Davis, 2015). Pathfinder projects aim to understand how coastal communities could adapt to changing conditions and evaluate the cost and benefits of different approaches.

In light of the SMP2 adopted by Gwynedd Council Cabinet in January 2013, a multi-agency Project Board (Fairbourne Moving Forward) was established in the village of Fairbourne (where SMP2 policies for the area advocate part, if not all, of the village to relocate or disperse elsewhere) to support the community in the transition towards long-term relocation (Bennett-Lloyd et al, 2019). This led to the subsequent formation of the Fairbourne Facing Change community action group (FFC) in February 2014. FFC was established partly as a direct response to the media attention given to the realignment issues at Fairbourne (Bennett-Lloyd et al, 2019). The FFC has observer status on the Fairbourne Moving Forward Board, with speaking rights at its request.

In Wales, additional frameworks for governance are provided under the legislative requirements of the Well-being of Future Generations (Wales) Act 2015, which challenges how public bodies provide services, including how they engage with members of the public in decision-making (Bennett-Lloyd et al, 2019). Under the Act, public bodies must take account of the following 'five ways of working:'

1. Looking to the long term so that they do not compromise the ability of future generations to meet their own needs.
2. Taking an integrated approach so that they look at all the wellbeing goals in deciding on their wellbeing objectives.
3. Involving a diversity of the population in the decisions that affect them.
4. Working with others in a collaborative way to find shared, sustainable solutions.
5. Understanding the root causes of issues to prevent them from occurring or getting worse.

The Act also established Public Service Boards for all local authority areas in Wales. These are comprised of public sector organisations (local authorities, Health Boards and Fire and Rescue Authorities) and are responsible for setting local wellbeing objectives and drafting local wellbeing plans (Bennett-Lloyd et al, 2019). The Well-being of Future Generations (Wales) Act 2015 offers a basis to progress new and inclusive ways of working to bring about complex long-term adaptive changes (Bennett-Lloyd et al, 2019).

9.6 Costs and benefits of public participation

This section summarises the literature that was reviewed to answer the following research question:

RQ5. What are the costs and benefits (to communities and RMAs) of members of the public participating in conversations about long-term adaptation?

A number of potential costs and benefits associated with community engagement in long-term adaptation decision-making were identified in the reviewed literature.

Raised awareness of risk, due to either environmental or policy changes, can cause negative impacts at the community level (Kelly and Kelly, 2019). This includes costs to local communities and RMAs, for example reduced property values or marketability (or perceptions of), increases in complaints and pressure group activity, changes in communities as people move away, business decline and increased stress. Kelly and Kelly (2019) emphasise that these impacts should be factored into cost-benefit calculations when evaluating management options.

A benefit of public participation is that it enhances capacity for collaborative decision-making in long-term FCERM (Kelly and Kelly, 2019) and involving different interested groups makes it possible to draw on the different strengths, abilities and experiences of different groups (Young et al, 2014 and Kelly and Kelly, 2019). In some cases, for example in Kilpheder (South Uist, Scottish Outer Hebrides), underlying socio-economic issues can make adaptive approaches to coastal management, such as withdrawal from the coast, an unacceptable option for communities (Young et al, 2014). In this case, high levels of public participation, with communities driving the decision-making process lead to unfavourable management decisions (Young et al, 2014). A community preference for 'hold the line' mitigation options is common and is often a barrier to adopting more environmentally sustainable approaches to coastal management (for example, McFadden, 2008 cited by Young et al, 2014).

Initial consultations with communities at the start of Pathfinders projects indicated that they had both positive and negative impressions of coastal adaptation, but negative perceptions outweighed the positive (Fenn et al, 2015). However, engagement with communities helped overcome this initial opposition to coastal adaptation. Increased awareness meant people were better informed about what was available to them and this led to more positive feelings regarding coastal adaptation options (Fenn et al, 2015). Additionally, public engagement in conversations about long-term adaptation enabled community expectations of support to better align with expectations that the council thought they should have (Fenn et al, 2015). Understanding what is available to them is beneficial to communities in areas at risk of coastal erosion as it allows residents to be able to get on with their lives (Fenn et al, 2015).

Carpenter et al (2018) explored the value of public perception research in engagement strategies for marine and coastal governance. Understanding public opinions on governance priorities can help researchers and authorities to make informed decisions about future funding priorities and management approaches (Carpenter et al, 2018). From a local authority perspective, engagement of whole communities is beneficial as it enables decisions to be taken based on sufficient data (Fenn et al, 2015). Conversely, it can also lead to increased disagreement as opinions can be significantly different among individuals (Fenn et al, 2015).

Some participants during the workshop felt that more evidence is needed about the benefits to communities of engagement in conversations about long-term adaptation.

9.7 Conclusions and evidence gaps

This review found little evidence of the kinds of people who are engaging in conversations about long-term adaptation, although those who have a greater stake in the local community are more likely to engage in long-term adaptation measures and decision-making. The evidence reviewed mainly includes communities engaging in conversations about long-term adaptation in response to the development (or lack) of FCERM strategies such as SMPs and FRMPs. People may engage using RMAs' formal consultation channels through community groups that mobilise to take action on managing flooding or coastal change or to put pressure on RMAs.

There is a need to better understand the factors that can facilitate a shift in expectations about who is responsible for managing coastal flood and erosion risks. Such a shift is difficult as it is thought to require more intensive resilience building efforts than are happening at present.

A fair amount of evidence exists around individual, social and institutional barriers to community engagement in conversations about long-term adaptation. Research is needed into the challenges associated with adaptation to severe climate change impacts, specifically where communities face potential relocation (Kelly and Kelly, 2019).

The reviewed evidence around costs and benefits of community engagement in long-term adaptation was disjointed and sometimes contradictory. Public participation enhances capacity for collaborative decision-making in long-term FCERM. However, where underlying socio-economic issues make adaptation options unacceptable to communities, high levels of public participation (where communities drive the decision-making process of FCERM strategies) can lead to greater disagreement due to significantly different opinions.

There are also challenges around knowing the appropriate scale to engage at. There is increasing recognition within agencies of the benefits of managing adaptation to flood at the catchment level rather than at the level of the individual community. However,

applying whole catchment thinking to engagement with communities living within the catchment is more challenging.

Some participants during the March 2020 workshop felt that more evidence is needed about the benefits to communities of engagement in conversations about long-term adaptation.

10 Comparing the FCERM activities

This chapter looks at the evidence across the 6 FCERM activities, and comments on similarities and differences in evidence for the first 5 research questions.

10.1 Extent and type of public engagement

For all 6 FCERM activities there is evidence of members of the public participating in different parts of the country (Twigger-Ross et al, 2015; Simm, 2015; Short et al, 2019; Famuditi et al, 2014). The vast majority of those who engage in FCERM activities have been affected by flooding either because their homes or businesses have been flooded or they have encountered disruption through flooding. People in locations where the flood risk is either more than minor or where there has been a recent damaging flood are more likely to come together in groups to prepare for response or recovery.

In the case of people engaging in preparing and changing their homes to reduce the impact of flooding, however, there is a discrepancy in the findings. Some studies show that only a small proportion of people who have been flooded take action to prepare and change their homes (Harries, 2012; Joseph et al, 2014), while other research indicates a higher level of involvement (Owusu et al, 2015; Defra, 2014).

There is little robust evidence that engagement in FCERM activities is associated with demographic factors such as gender, age, income or place of residence (for example, rural versus urban). For example, the survey conducted as part of research for the Environment Agency on flood volunteering found that 61% of respondents lived in rural areas (Ambrose-Oji et al, 2015). However, the Environment Agency's own evidence suggests that there are a large number of urban flood groups (pers. communication, 2020).

Having a background in activities related to water systems (including farming and engineering, for example) facilitates engagement in practical activities such as managing assets or NFM (Simm, 2015; Whatmore and Landstrom, 2011). Conversely, in communities where relevant skills are less common, civil society groups will be less likely to form around flood volunteering. There is therefore a risk that relying on these sorts of volunteering activities to build community resilience could increase inequalities (Forrest et al, 2018).

There were many examples in the literature of groups coming together to prepare for response and recovery. Only one study described businesses coming together for this purpose (Johnson and McGuinness, 2016).

10.1.1 When do people engage?

Timing is an important factor for understanding the work of most flood groups, as their focus will generally change over time, with the most intense engagement in the period immediately after a flood event (Forrest et al, 2018). Different reasons are given for the frequent decrease in activity as time passes following the flood event. McEwen et al (2019) describe a process of 'active forgetting' as people seek to put the experience of flooding behind them. Greaves and Penning-Rowsell (2015) attribute the decline in engagement to apathy on the part of those affected or a response to action by the authorities to reduce the flood risk.

Some groups sustain engagement over long periods of time, for example in physical asset maintenance (Simm, 2015), flood warden groups (Orr and Johnston, 2017) and NFM (Smith and Uttley, 2016; Lavers and Charlesworth, 2018; Short et al, 2019). It is important to have a strategy and budget to sustain engagement (Everett and Lamond, 2018).

10.1.2 How and in what ways do people engage?

Ambrose-Oji et al (2015)'s typology of flood volunteering activities provides a useful way of thinking about different kinds of engagement. In all 6 FCERM activities, individuals and communities are engaged in 2 or more types of activities, as shown in Table 10.1.

Table 10.1 Types of flood volunteering, by area of activity

	Knowledge-focused	Physical-focused	Campaign-focused	Virtual-focused
1. Managing assets	Y	Y		
2. Incident response and recovery	Y	Y	Y	Y
3. Decisions, design, funding	Y		Y	Y
4. Managing land	Y	Y	Y	Y
5. Improving homes	Y			Y
6. Adapting to climate change	Y		Y	Y

Much of the work of communities engaged in FCERM includes all these types of activities (Forrest et al, 2017). In Calderdale (West Yorkshire) and Cumbria, local residents, flood wardens, community associations and others have come together to create 'flood hubs' to develop emergency flood plans and to set about flood recovery (Forrest et al., 2018). A qualitative study of 12 CAGs showed that although most had started as single-issue groups, some had diversified into campaigning, direct action and sometimes education and active partnerships with statutory authorities (Famuditi et al, 2018).

Most of the literature looking at the engagement of communities in the decision-making, design and funding for local flood schemes identified an aspiration to use community groups to include local people in FCERM decision making. One paper, based on research with 3 flood forums in Belfast, was more critical of the effectiveness of these organisations in representing local people in decision-making (Moon et al, 2017).

10.2 Barriers and facilitators to participation

Across the 6 FCERM activities, the literature highlights that a sense of personal responsibility is an important factor in encouraging participation in FCERM (for example, Forrest et al, 2018). Relying on publicly-provided flood protection and believing that someone else will sort things out were found to be significant barriers to engagement in FCERM. People also need to believe that they can take action and that the actions they take will be effective.

It is essential that future research increases understanding of how this sense of responsibility and agency develops. Many authors point out that there are strong emotional responses associated with flooding which affect decisions that individuals make about protecting their homes. People may refuse to accept or deny that they are at flood risk and the need for protective measures, even after they have been affected

by flooding (Everett and Lamond, 2013; Everett and Lamond, 2014). Prior experiences of flooding and recovery, connection to place/place attachment, and knowledge of future risk contribute to complex feelings that can influence people's responses to information about flood and coastal erosion risk and the possible measures they could take (Kelly and Kelly, 2019). These aspects need to be considered in any engagement.

Institutional factors can be important barriers to or facilitators of engagement. Mees et al (2016) suggest that because the public has no statutory right to flood protection in the UK, members of the public take individual action to try to resolve their local flood risk. Other authors take the opposite view and argue that despite the lack of legal basis, people in the UK expect that the government should take action and are unwilling to take action themselves (Forrest et al, 2018).

The way that public bodies with responsibilities for FCERM engage with local interested groups has in the past been a barrier to participation, for example the failure of public authorities to engage with local knowledge in an open-minded way (Whatmore and Landstrom, 2011) or to involve local interests in the early phases of opportunity mapping as a part of NFM approaches (Lavers and Charlesworth, 2018). Whatmore (2014) argues that the tendency of authorities and members of the scientific community to see public scrutiny as something to be avoided is itself a substantial barrier to engagement. A lack of trust in authorities was identified as a factor that limits public engagement in a range of FCERM activities.

Economic issues were identified as a material barrier to engagement. This can be because of lack of funding for implementing NFM measures, for example, the costs to volunteers of participation (including travel to meetings or activities, postage and photocopying (O'Brien et al, 2014) or the costs of engagement for RMAs.

There is some evidence in the literature about different kinds of barriers to engagement in FCERM. There is less evidence on how these barriers could be overcome or on possible facilitators of engagement.

10.3 Approaches and models of participation

Some good practice approaches to engaging members of the public in FCERM were identified across the 6 FCERM activities. These include:

- thinking through and being clear about the objectives of involving members of the community in each place
- mapping community groups to understand their characteristics (Colvin et al, 2016) and build on existing social capital, possibly embedding flood initiatives in wider issues of community concern such as housing, health and wellbeing
- linking community and stakeholder groups (for example, local farmers and landowners) to the wider flood management system, so that they can exchange information, learn from and contribute to the work of other partners

There is evidence that using a trusted intermediary such as the NFF can encourage successful partnership and public participation (Greaves and Penning-Rowsell, 2015; Twigger-Ross et al, 2015).

Developing a shared understanding of local flooding situations through a combination of knowledge and experience is seen as vital for communicating, learning, negotiating and reaching collective decisions among different people and groups involved in partnership working (Mehring et al, 2018). Everett and Lamond (2018) also highlight the urgency for authorities to move beyond the DAD model towards an EDD approach.

Defra (2014) and Orr et al (2016) encourage a collaborative approach between the RMAs and local residents and emphasise the importance of a flood group being involved. Lamond et al (2019) however, noted that there are a number of factors that make this challenging both for the individuals and the institutions involved. Recovery from flooding is an emotional rollercoaster. Introducing and implementing new ideas (for example, resilient reinstatement) need to be carried out in relationships of trust and empathy between professionals and policy holders (Lamond et al, 2019). Involving many different professionals leads to the implementation of PFR becoming fragmented. Current research (Environment Agency, 2019c) evaluating the PFR Pathfinders should provide some useful insights into how these factors might be overcome.

Kelly and Kelly (2019) explore a number of engagement approaches and practices. For example, role play or simulations are considered positive in terms of giving participants empathy and insight into the views of others and building collaborative capacity. The drawbacks of role play as an engagement approach are the costs in terms of facilitation resources and time required from participants, resistance to the idea of game playing among some interested groups and uncertainty of the outcomes, which are dependent to a great extent on what participants put into the process. Overall, Kelly and Kelly (2019) comment that role playing or simulation should not be seen as a stand-alone activity but as one element of an engagement process.

Approaches to consultation on the second round of SMPs suggest that the strategic nature of the plans meant that effective local dialogue, local influence on outcomes or examination of implications arising from the policies at local level was challenging (Bennett-Lloyd et al, 2019). Interested groups perceived a lack of coherence in the planning and implementation of public and stakeholder engagement at the strategic plan preparation level. At the public and community level in particular, there was little evidence of effective or well-planned communication/discussion during the framing of the plan's objectives or development of its content (Bennett-Lloyd et al, 2019). The weaknesses of the consultation process and limited capacity for engagement in the preparation phase of SMP2 impacted on the delivery phase in terms of community and stakeholder knowledge and understanding of the content, function and status of the SMP2. Shifting engagement resources towards the beginning of the planning process could have saved time in the later stages (Bennett-Lloyd et al, 2019).

10.4 Types of governance that affect participation

While public policy on FCERM in both the EU and in England enable public participation, neither the EU Floods Directive (2007) nor the Flood and Water Management Act 2010 have been instrumental in encouraging more effective participation or consultation.

In Wales, the Well-being of Future Generations (Wales) Act 2015, establishes 'five ways of working' with interested groups. The emphasis on looking to the long term, taking an integrated approach, involving a diversity of the population in decisions, working collaboratively with others and identifying the root causes of problems provide a valuable foundation for addressing complex issues around flooding and coastal erosion which require long-term adaptive solutions. Public sector organisations at the local authority level are responsible for setting local wellbeing objectives and drafting local wellbeing plans.

O'Brien et al (2015) identified several governance types relating to volunteering, including volunteering for oneself; volunteering direct for the Environment Agency; volunteering in partnership and volunteering through others. However, overall patterns of response from the online survey and interviews of volunteers did not suggest that any form of volunteer governance is significantly different from any other in terms of facilitating or inhibiting volunteering.

Several publications suggested that RMAs adopt technocratic approaches that make it more difficult for members of the public and local interested groups such as farmers and landowners to engage in FCERM. They argued that technocratic ways of working that drive knowledge and power hierarchies are still evident in the Environment Agency's 'Working with Others' guide. In order to continue viewing community engagement as means to an end it is believed that authorities should recognise the value of simply listening to communities and learning about their experiences and fears in order to acquire their knowledge and understand their ideas (Barnes and Schmitz, 2016; Mehring et al 2018). Similarly, Begg et al (2018) found that the context in which decisions are made tend to be expert-led and are framed and rationalised from an economic perspective through the Partnership Funding approach. This, in turn, limits local decision making because this depends on the local socio-economic context (for example, deprivation levels, urban versus small rural characteristics).

Innovative local governance initiatives include:

- volunteer-led flood hubs or flood groups: members of the community providing useful information to others. In communities where strong community bonds and networks already exist members of the public are likely to be motivated to participate. In locations where the sense of community identity is weak, where strong community networks do not exist or where there is greater poverty and deprivation, there may be less motivation to participate
- collaborative models of participation in which local councils work together to build a trusting and fruitful relationship with community flood groups/residents with the support of third parties such as the NFF and other agencies is considered to be most conducive to participation (Twigger-Ross et al, 2015). Participatory working and learning can be improved by re-imagining the traditional roles of experts and lay people (Rollason et al, 2018). For example, lay people often have local flood knowledge (for example, about surface water flooding) that experts do not have, whereas flood experts have other knowledge that lay people do not have. Therefore, this model has experts and lay people working together as equals to co-produce shared knowledge and outputs
- model of collaboration and governance proposed by Johnson and McGuinness (2016), using Business Innovation Districts (BIDs) as an innovative, democratic governance structure, which encourages small and medium size enterprise owners and managers to 'club' and work together. These can provide a mechanism for working together to manage flood risk, as shown by a BID in Sheffield

10.5 The costs and benefits to communities and RMAs of public participation

While there is evidence of the benefits of community engagement in different areas of FCERM, only limited work has been done to assess and quantify the costs and benefits identified (Ambrose-Oji et al, 2015). The literature identifies a range of benefits, such as building trust between RMAs and communities (O'Brien et al, 2015; Burgess-Gamble et al, 2017) and increasing local understanding of issues such as the need for long-term adaptation (Young et al, 2014; Kelly and Kelly, 2019). For NFM in particular, the benefits of involving a range of local people were felt to be essential and to result in more impactful NFM responses, because of the impact of land management on downstream communities (Löschner et al, 2016; Lavers & Charlesworth, 2018).

In the case of PLR, there is still a lack of evidence and, in some cases, disagreement about the benefits of specific measures, which can lead to a lack of clarity about what works in which situations and how that should be achieved (Lamond et al, 2019).

The literature also documents some of the costs of engagement to members of the public, RMAs and other interested groups:

- costs to individuals include not just the financial costs of purchasing property level protection equipment (for example, flood gates) (Greaves and Penning-Rowsell, 2015), reduced property values or marketability (or perceptions of), changes in communities as people move away and business decline (Kelly and Kelly, 2019). Individuals also experience increased stress as a result of raised awareness of risk (Kelly and Kelly, 2019) and of participating in meetings and formal consultations (Greaves and Penning-Rowsell, 2015)
- RMAs have costs associated with the time and effort involved in gaining a good understanding of a community, carefully nurturing and building trust and working with communities and their members who can sometimes be inconsistent, contradictory or in conflict over aspects of FCERM or related community matters (Greaves and Penning-Rowsell, 2015; Waylen et al, 2018)
- in the FCERM activities where there are strong differences of opinion, high levels of public participation with communities driving the decision-making process may have a cost in terms of unfavourable management decisions as in a case in South Uist (Outer Hebrides) described by Young et al (2014)

O'Brien et al (2014) note that decisions about the allocation of resources to FCERM volunteering are made on the basis of cost-benefit analyses, which often fail to capture intangible, indirect and unseen benefits of FCERM volunteering. They suggest that the scope of economic analyses may need to be broadened to take account of these benefits, and that those advocating the involvement of volunteers need to present the evidence for this more effectively.

Some work has been done to develop reliable methods to quantify the costs and benefits of the participation of local communities and volunteers, based on methods used to assess the impact of flood awareness initiatives on reducing flood damages (Twigger-Ross et al, 2015). Further work to develop this kind of approach could provide a more comprehensive understanding of costs and benefits

11 Research gaps

11.1 Introduction

This chapter provides a list of the gaps in evidence that have been identified from the literature review, the expert interviews and the 2019 workshop[10] carried out before this research was commissioned.

Section 11.2 discusses the process and presents the outcomes from identifying the gaps. The research gaps have been framed as questions to present them as clearly as possible.

As a general point, across all 6 FCERM activities the team was struck by the low numbers of academic papers published on communities and FCERM in the UK given the amount of practical engagement by individual members of the public and groups in FCERM. This means that findings are often relying on only a few studies.

The strength of evidence for each FCERM activity was assessed and this is presented in Appendix C. Overall, chapter 6 (Engaging with decisions, designs and funding for schemes) had the weakest evidence base, while chapter 5 (Preparing for, responding to and recovering form incidents) had the strongest evidence base.

11.2 List of identified gaps by research team

11.2.1 Identifying gaps

To develop a single list of gaps, firstly, the gaps from each of the 6 FCERM activities identified in the literature review (see Appendix D) were discussed in a team telecom. Secondly, gaps were also identified through the process of expert interviews (see Appendix E). Considering both these sources, an initial list of gaps was generated (see Appendix F). In the process, the issue of the relationship between experiential knowledge and academic knowledge emerged. That is, how to validate the experiences and knowledge of staff and individual members of the public and groups, yet keep them distinct from academic papers that aim to systematise and generalise knowledge.

In preparation for the stakeholder workshop in March 2020, the gaps from the 2019 workshop were also considered (see Appendix G). By acknowledging the gaps identified from these various sources, a single list of gaps was prepared to be presented to workshop participants. The list is shown in Table 11.1.

Table 11.1 List of gaps identified from the literature review, expert interviews and the original workshop

[10] The workshop was held in Jan 2019 and was attended by Defra and Environment Agency staff together with academic social scientists and the Chief Executive of the National Flood Forum.

	List of gaps
1.	**Systematic identification and evaluation of individual members of the public and groups working with RMAs in each of the 6 FCERM activities across England and Wales -** Who is participating? How are they participating? How effective is the participation? How can successes and challenges be shared and built upon?
2.	**Sustaining participation** - What does 'sustained participation' look like for all types of activity? What are the influencing factors and how can participation be resilient? How do people get involved and stay involved in flood groups?
3.	**Flood recovery -** How are individual members of the public and groups engaging in flood recovery? What types of activities and actions are they carrying out? How can those activities be supported to increase personal resilience within the recovery process, specifically for people who are relocated? How can those who are most vulnerable be supported?
4.	**Farmers and participation in FCERM, specifically natural flood management and maintenance of assets -** How do farmers make decisions about natural flood management? What are the factors that contribute to their decision making? How do farmers work with communities around asset maintenance? What tools and approaches do RMAs need to help engage and work with farmers and landowners, specifically, around natural flood management?
5.	**The role of emotions and identities (individual and group) in participation -** How do emotions, personal and social identities influence participation? What are the psychological challenges associated with place detachment? Forming attachments to altered or completely different places is an aspect of climate change adaptation - how does this affect participation in conversations about long-term adaptation?
6.	**Managing the emotional aspects of flooding for professionals** - How do professionals (such as loss adjustors, surveyors, builders) engaged in property flood resilience in reinstatement specifically, but RMAs and professionals generally, manage and cope with the emotional aspects of flooding? What training and support might be appropriate for them to engage effectively with individual members of the public and groups during recovery?
7.	**Influence of participation on FCERM decision making: schemes, strategies and long-term adaptation** - What influence do individual members of the public and groups have on FCERM decisions? How do different types of participation (from consultation to co-creation) really influence FCERM decision making? What are the mechanics of those processes and whose views are represented?
8.	**The role of community flood knowledge** - What role can/does community flood knowledge play? To what extent is community flood knowledge taken into account and how does it influence decisions taken? How do communities learn about flood risk and how can that enable participation in assessment and modelling by RMAs?
9.	**Links between formal statutory consultation processes/wider political processes and local participation in FCERM activities -** What are the links between statutory processes and participation in FCERM activities, for example, within the planning systems or for flood schemes? How do these interact? How can they complement each other and how does trust in one relate to action in another?
10.	**Characteristics of RMAs that influence participation in FCERM activities -** What are the characteristics of institutions (for example, RMAs) that facilitate/inhibit participation with individual members of the public and groups? How do organisational cultures, including language used by RMAs facilitate or inhibit participation across the 6 FCERM activities? What is the role of trust? What are the specific issues for NFM?
11.	**Decision making in flood recovery -** How are decisions made by the insurance industry and the related professionals (for example, loss adjusters) during flood recovery and also when insurance is bought by members of the public? How are members of the public and communities involved in those processes?
12.	**Cost and benefits of participation -** What are the financial costs and benefits of participation for individual members of the public and groups and RMAs? How to

List of gaps
evaluate costs and benefits of the different activities? What is the value given to this work by the local community, the Environment Agency and other RMAs and by the individuals involved?

11.2.2 Prioritisation of gaps

In the expert workshop participants were asked to prioritise the evidence gaps listed in Table 11.2 to help shape the development of the Communities and FCERM R&D framework. The participants were divided into groups depending on their occupation. The groups were as follows:

- Group 1 – Environment Agency practitioners
- Group 2 – Academics and researchers
- Group 3 – Other practitioners (non-Environment Agency)

It was agreed that the MoSCoW method[11] would be used for the prioritisation. The outcome of this exercise is presented in table 10.3. The number assigned to each gap in Table 11.2 was used to facilitate the prioritisation.

Table 11.2 Gaps prioritised by groups

MoSCoW	Group 1	Group 2	Group 3
Must	3 & 11, 12, 6, 1 & 2, 7, 8	2, 4	2, 3, 7 & 9, 8
Should	10	5 & 6, 11	5 & 6, 10
Could	4, 5	3, 8, 10	11, 12
Won't	9	1, 7, 9, 12	1, 4

11.3 Summary of the results of the gap prioritisation exercise

The prioritisation exercise produced one clear 'winner': the 3 groups agreed that gap 2 on sustained participation was a topic that must be researched.

Other gaps that were considered priorities by 2 of the 3 groups were:

- gap 3 - How are individual members of the public and community groups engaging in flood recovery?
- gap 8 - The role of community flood knowledge.
- gap 7- The influence of participation in FCEM decision-making: schemes, strategies and long-term adaptation.

Two gaps were considered to be not worth doing ('Won't') by 2 of the 3 groups:

[11] The MoSCoW method is a prioritisation technique for managing requirements and is used to help key stakeholders understand the significance of initiatives in a specific release. MoSCoW stands for: must-haves, should-haves, could-haves, and will not have at this time

- gap 1 - Systematic identification and evaluation of individual members of the public and groups working with RMAs in each of the 6 FCERM activities across England and Wales.
- gap 9 - Links between formal statutory consultation processes / wider political processes and local participation in FCERM activities.

Reasons for prioritising gaps included the importance of the topic and the lack of existing research. Gaps that were felt to be less of a priority were ones where workshop participants felt that there was already evidence available or where the focus of the gap was not clearly explained. A summary of the discussion of criteria for gap prioritisation is provided in Appendix H.

12 Discussion and next steps

The review had raised a number of key issues with respect to communities participating in FCERM activities. Overall, it has provided a detailed review of the UK literature across 6 different FCERM activities. The findings are varied and complex, reflecting the nature of participation and the range of FCERM activities. It is clear that while there are some underlying principles of participation, each FCERM activity had its own nuances and complexities.

Key points that have emerged:

1. People who have been flooded or have been affected by flooding and have a stake in the activity or decision making are more likely to be participating. However, it is clear for some areas (for example, PFR) that participation might lead to more negative emotions due to the acceptance of future flooding.
2. People are participating across the UK in a wide range of FCERM activities with their knowledge, time and energy.
3. Ongoing engagement that focuses on developing relationships of trust seem to be more effective in sustaining participation. Combining this with a clear task focus seems to be effective, for example maintenance of assets.
4. Different approaches to participation work in different situations (for example, farmers, low income areas, areas at risk of coastal erosion). RMAs understanding and listening to communities was shown to improve participation and outcomes.
5. Governance mechanisms to enable participation vary in their effectiveness, with the fragmentation of the recovery phase being a challenge and the mechanisms for engagement with decision making around schemes lacking.

This review has focused on UK research and while there is growing body of that research there are still only a few papers for each FCERM activity, making it hard to generalise from findings. Much of the research is focused on case studies of FCERM activities, and there is little that is driven by clear theories of participation. The emphasis in past research has been on qualitative studies, which provide rich pictures of the processes of participation but less about the extent and distribution of that participation. There are good examples of applied participatory research where the Environment Agency trialled approaches that cover some of the FCERM activities covered in previous chapters.

In terms of strength of evidence chapter 6 (Engaging with decisions, designs and funding for schemes) had the weakest evidence base, whereas chapter 5 (Preparing for, responding to and recovering from incidents) had the strongest evidence base. This is interesting since engagement with communities is a clear part of the development and implementation of schemes yet there is little research into its practice. In relation to chapter 5, while it did have the strongest evidence base, it was felt that there would have been more studies. This is the area where there is most practice (for example, flood action groups) and where the NFF has its greatest focus, yet it does not seem to be systematically examined apart from by a couple of authors.

Going forward, the literature review and gap analysis will inform the development of the research framework, which will consist of developing a long list of projects (up to 10). These will then be prioritised according to criteria developed with the steering group. The top 5 projects will be developed into proposals and put into a plan to implement them.

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Acronyms

BGI	Blue-green infrastructure
BID	Business Improvement District
CAG	**C**oastal action group
CEP	Collingwood Environmental Planning
DAD	Decide, announce, defend
DASH group	Direct action self-help group
Defra	Department for Environment, Food and Rural Affairs
EDD	Engage, deliberate, decide
FCERM	Flood and coastal erosion risk management
FFC	Fairbourne Facing Change
FRMP	Flood risk management plan
FWMA	Flood and Water Management Act (2010)
ISM	Individual, Social, Material
LLFAs	Lead local flood authorities
NFF	National Flood Forum
NFM	Natural Flood Management
NGO	Non-governmental organisation
PICO	Problem/Patient/Population, Intervention/Indicator, Comparison, Outcome and Time/Type of study
PFR	Property flood resilience
RMAs	Risk management authorities
SMEs	Small and medium-sized enterprises
SMP	Shoreline management plan
SuDS	Sustainable urban drainage system

Appendix A. Details of e-search

Scope

The inclusion/exclusion criteria for the search strategy is presented in Table A.1.

Table A.1 Inclusion and exclusion criteria

Exclusion criteria	Comment
Exclude studies not in English.	
Exclude any research that is not relevant to flood.	
Exclude research that doesn't address participation of members of public.	In other words, if it is about technical flood risk only, discard it.
Inclusion criteria	**Comment**
Include UK to start, then EU and US.	
Include literature from 2014 onwards.	
Include any method.	Includes review articles as well as empirical studies.
Include peer-reviewed research and grey literature.	Note in the report the quality of research used as evidence (including whether it has been peer reviewed/published in a journal).
Include literature that examines participation of members of the public across all sources of flooding and coastal erosion on all/any of the 6 FCERM activities.	Includes: ▪ asset management ▪ preparations for incident and recovery ▪ decision making, design and funding for schemes ▪ land management ▪ repairs and modification of homes and discussions on long-term adaptation

Key words

The key words used to complete the e-search are presented in Table A.2.

Table A.2 Key words used in the e-search

Keywords related to	Description
The population	Individual; communities; resident; volunteer; public; champion.
The FCERM activity	Barriers; limits; facilitators; aid; promote; approach; model; governance; policies; systems; processes; costs; benefits; assets, preparation, emergency, recovery, schemes, strategies, decision-making, land management, properties, repairs, adaptation.
The comparator	Participation; engagement; activity; action.
The outcome	Not applicable as not focused on engagement.

Keywords related to	Description
Other relevant keywords	United Kingdom; flood; differences.

The following search strings were used in the Scopus search:

1 (**Individual*** OR **communit*** OR **residents** OR **volunteers** OR **public** OR **champion***) AND (**participat*** OR **engage*** OR **activit*** OR **action**) AND **flood*** AND '**United Kingdom**' AND

- (**assets**, OR **preparat*** OR **emergenc*** OR, r**ecovery**, OR **schemes**, OR **strategies**, OR **decision-making**, OR **land management**, OR **property***, OR **repairs**, OR **adapt***)
- OR (**barrier*** OR **limit*** OR **facilitat*** OR **aid** OR **promot***)
- OR (**approach** OR **model**)
- OR (**governance** OR **policies** OR **systems** OR **processes**)
- OR (**costs** OR **benefits**)

Source locations

- The locations used in the search to gather relevant literature are summarised in Table A.3.

Table A.3 Source locations

Reference locations	Description
Peer reviewed evidence (for example, bibliographical databases)	Scopus; and the results from a literature search request by the Environment Agency
Grey literature (for example, websites of key organisations)	▪ Google (which scans grey, government and commercial sources) ▪ Defra website ▪ Environment Agency website ▪ Environment Agency R&D (current ongoing and past) ▪ Cabinet Office/ Welsh/Scottish/NI government websites ▪ Joint Programme portal ▪ Joseph Rowntree Foundation website ▪ The Behavioural Insights Team website
Unpublished data (for example, key experts to be interviewed)	Key experts and steering group members
Will other reviews and secondary reviews be considered?	Yes
Will solely theoretical or conceptual studies be considered?	No

Appendix B. Robustness of reviewed literature

FCERM activity	Author	Year	Title	Published	Robustness Score
Managing flood risk assets	**Ambrose-Oji, O.Brien, Morris and Williams**	2015	Report: SC120013/R1 Work Package 1 report: FCERM volunteer baseline data and typology development	Environment Agency	2.7
Managing flood risk assets	**Ambrose-Oji, O.Brien, Morris and Williams**	2015	Report SC120013/R2 Work Package 2 report: Developing an FCERM evaluation framework	Environment Agency	2.7
Managing flood risk assets	**Ambrose-Oji, O.Brien, Morris and Williams**	2015	Report – SC120013/R3 Work Package 3: Case study, survey, diary and interview research on FCERM volunteering	Environment Agency	3
Managing flood risk assets	**Carr**	2002	Grass Roots and Green Tape	The Federation Press, Sydney, Australia	N/A
Managing flood risk assets	**Forrest, Trell and Woltjer**	2018	Civil society contributions to local level flood resilience: Before, during and after the 2015 Boxing Day floods in the Upper Calder Valley	Wiley	3
Managing flood risk assets	**Horton Smith**	2000	Grassroots Associations	Sage Publications Inc, Thousand Oaks CA	3
Managing flood risk assets	**O'Brien, Edwards, Ambrose-Oji, Morris and Williams**	2014	Volunteers' contribution to flood resilience	Environment Agency Research Report	3
Managing flood risk assets	**Putnam and Feldstein**	2003	Better together: restoring the American community	Simon and Schuster, New York	2.6
Managing flood risk assets	**Short et al**	2019	Capturing the multiple benefits associated with	Land Degradation	3

			nature-based solutions: Lessons from a natural flood management project in the Cotswolds, UK	and Development	
Managing flood risk assets	**Simm**	2015	Direct Action Self-Help (DASH) Groups in UK Flood Risk Management (the research itself and additional considerations)	University of Nottingham. Summary paper available in Proc. FLOODrisk 2016	3
Managing flood risk assets	**Soetanto, Mullins and Achour**	2017	The perceptions of social responsibility for community resilience to flooding: the impact of past experience, age, gender and ethnicity	Natural Hazards	2.8
Managing flood risk assets	**Twigger-Ross et al**	2015	Flood Resilience Community Pathfinder Evaluation Final Report	Defra	2.8
Managing flood risk assets	**Warwickshire County Council**	2015	Warwickshire Community Flood Resilience Pathfinder Project Final Report	Project Report for Defra	3
Managing flood risk assets	**Wenger, McDermott and Snyder**	2002	Cultivating Communities of Practice	Harvard Business Press	3
Preparing for, responding to and recovering from incidents	**Bhattacharya-Mis and Lamond**	2014	An investigation of patterns of response and recovery among flood-affected businesses in the UK: A case study in Sheffield and Wakefield	WIT Transactions on Ecology and the Environment	2.7
Preparing for, responding to and recovering from incidents	**Currie, Philip and Dowds**	2020	Long-term impacts of flooding following the winter 2015/16 flooding in North East Scotland: Summary Report	CREW – Scotland's Centre of Expertise for Waters	1.8
Preparing for, responding to and recovering from incidents	**Defra/ Environment Agency**	n.d.	Digital flood histories: Summary	Environment Agency	1.2

Preparing for, responding to and recovering from incidents	**Dittrich et al**	2016	The impact of flood action groups on the uptake of flood management measures	Climatic Change	2.8
Preparing for, responding to and recovering from incidents	**Edwards et al**	2015	Issues and options concerning FRCM volunteering Report – SC120013/R4	Environment Agency	2.3
Preparing for, responding to and recovering from incidents	**Environment Agency**	n.d.	Investigating and appraising the involvement of volunteers in achieving FCERM outcomes. Project Summary FD SC120013/S	Flood and Coastal Erosion Risk Management and Development Programme, Environment Agency, Bristol	2.8
Preparing for, responding to and recovering from incidents	**Forrest, Trell and Woltjer**	2018	Civil society contributions to local level flood resilience: Before, during and after the 2015 Boxing Day floods in the Upper Calder Valley	Transactions of the Institute of British Geographers	2.5
Preparing for, responding to and recovering from incidents	**Geaves and Penning-Rowsell**	2015	'Contractual' and 'cooperative' civic engagement: The emergence and roles of flood action groups in England and Wales	Ambio	2.8
Preparing for, responding to and recovering from incidents	**Johnson and McGuinness**	2016	Flood resilience in the context of shifting patterns of risk, complexity and governance: An exploratory case study	E3S Web Conference 7, 21004 Flood risk 2016, 3rd European Conference on FCERM	2.7
Preparing for, responding to and recovering from incidents	**McEwen et al**	2018	'Learning for resilience': Developing community capital through flood action groups in urban flood risk settings with lower social capital	International Journal of Disaster Risk Reduction	2.2
Preparing for, responding to and recovering from incidents	**Medd et al**	2015	The flood recovery gap: A real-time study of local recovery following the floods of June	Journal of Flood Risk Management	2.7

			2007 in Hull, North East England		
Preparing for, responding to and recovering from incidents	**O'Brien et al**	2014	Volunteers' contribution to flood resilience - Research report	Forest Research	2.3
Preparing for, responding to and recovering from incidents	**O'Brien et al**	2015	Case study, survey, diary and interview research on FCERM volunteering. Final report FD120013/R13	Joint Flood and Coastal Erosion Risk Management Research and Development Programme, Environment Agency, Bristol	2.8
Preparing for, responding to and recovering from incidents	**Orr and Johnson**	2018	Communities prepared (pilot) evaluation. An evaluation for Cornwall Community Flood Forum, Cornwall College and Groundwork South. Final evaluation report	London: Collingwood Environmental Planning Ltd	2.7
Preparing for, responding to and recovering from incidents	**Poussin et al**	2014	Factors of influence on flood damage mitigation behaviour by households	Environ Science & Policy	2.7
Preparing for, responding to and recovering from incidents	**Rollason et al**	2018	Rethinking flood risk communication	Natural Hazards	2.7
Preparing for, responding to and recovering from incidents	**Shaw et al**	2015	Spontaneous volunteers: Involving citizens in the response and recovery to flood emergencies. Final report FD2666	Joint Flood and Coastal Erosion Risk Management Research and Development Programme, Defra, London	3
Preparing for, responding to and recovering from incidents	**Twigger-Ross et al**	2015	Flood resilience community pathfinder evaluation Final Report FD 1664	Joint Flood and Coastal Erosion Risk Management Research and Development Programme, Defra, London	3
Preparing for, responding to and	**When et al**	2018	Participation in flood risk management and	Environmental Science & Policy	2.3

recovering from incidents			the potential of citizen observatories: A governance analysis		
Preparing for, responding to and recovering from incidents	**Wright**	2016	Resilient communities? Experiences of risk and resilience in a time of austerity	International Journal of Disaster Risk Reduction	2.5
Taking part in decisions, designs and funding for schemes	**Begg et al**	2018	The role of local stakeholder participation in flood defence decisions in the United Kingdom and Germany	Journal of Flood Risk Management	2.6
Taking part in decisions, designs and funding for schemes	**Forrest, Trell and Woltjer**	2017	Flood Groups in England: Governance arrangements and contribution to flood resilience	'Governing for Resilience in Vulnerable Places'; Editors: Elen-Maarja Trell, Britta Restemeyer, Melanie Bakema and Bettina van Hoven. Published by Routledge, Oxon.	2.4
Taking part in decisions, designs and funding for schemes	**Howarth and Brooks**	2017	Decision-Making and Building Resilience to Nexus Shocks Locally: Exploring Flooding and Heatwaves in the UK	Sustainability	1.8
Taking part in decisions, designs and funding for schemes	**Mees et al**	2016	Coproducing flood risk management through citizen involvement insights from crosscountry comparison in Europe	Ecology and Society	2.8
Taking part in decisions, designs and funding for schemes	**Moon, Flannery and Revez**	2017	Discourse and practice of participatory flood risk management in Belfast, UK	Land Use Policy	2.5
Taking part in decisions, designs and funding for schemes	**Shaun et al**	2016	Participatory modelling for stakeholder involvement in the development of flood risk	Environmental Modelling & Software 82 (2016) 275e294	2.3

			management intervention options		
Taking part in decisions, designs and funding for schemes	**Thaler and Levin-Keitel**	2016	Multi-level stakeholder engagement in flood risk management—A question of roles and power: Lessons from England	Environmental Science & Policy	2
Managing land to achieve flood risk benefits	**Everett & Lamond**	2018	Considering the Value Of Community Engagement For (Co)-Producing Blue-Green Infrastructure	In S. Hernández, S. Mambretti, D. Proverbs, & J. Puertas (Eds.), Urban Water Systems & Floods IIWIT Press	2.7
Managing land to achieve flood risk benefits	**Everett and Lamond**	2014	A Conceptual Framework for Understanding Behaviours and Attitudes Around 'Blue-Green' Approaches to Flood-Risk Management	International Conference on Flood Recovery, Innovation and Response (FRIAR), 18-20th June 2014, Poznan, Poland	2.5
Managing land to achieve flood risk benefits	**Everett and Lamond**	2013	Household behaviour in installing property-level flood adaptations: a literature review	WIT Sustainable Cities, published in The Sustainable City VII	2.3
Managing land to achieve flood risk benefits	**Holstead et al**	2017	Natural flood management from the farmer's perspective: criteria that affect uptake	Journal of Flood risk management	2.8
Managing land to achieve flood risk benefits	**Lavers and Charlesworth**	2018	Opportunity mapping of natural flood management measures: a case study from the headwaters of the Warwickshire-Avon	Environmental Science and Pollution Research	2.4
Managing land to achieve flood risk benefits	**CIRIA - McIntyre, N, Thorne, C (editors)**	2013	Land use management effects on flood flows and sediments –	CIRIA	N/A

			guidance on prediction		
Managing land to achieve flood risk benefits	**Mehring et al**	2018	What is going wrong with community engagement? How flood communities and flood authorities construct engagement and partnership working	Environmental Science and Policy	2.7
Managing land to achieve flood risk benefits	**Potter and Vilcan**	2020	Managing urban flood resilience through the English planning system: insights from the 'SuDS-face'	Philosophical Tranactions. Royal Society	2.5
Managing land to achieve flood risk benefits	**Smith and Bond**	2018	Delivering more inclusive public participation in coastal flood management: A case study in Suffolk, UK	Ocean and Coastal Management	3
Managing land to achieve flood risk benefits	**Smith, Clifford and Mant**	2014	The changing nature of river restoration	WIREs Water	1.8
Managing land to achieve flood risk benefits	**Smith and Uttley**	2017	Case study 13. Stroud Rural SuDS Project: Community Engagement in NFM	In Burgess-Gamble et al. 2017	N/A
Managing land to achieve flood risk benefits	**Waylen et al**	2018	Challenges to enabling and implementing Natural Flood Management in Scotland	Journal of Flood Risk Management	3
Managing land to achieve flood risk benefits	**Whatmore**	2014	Impact Case Study: Engaging communities in flood risk science and management	Research Excellence Framework 2014	2.3
Managing land to achieve flood risk benefits	**Whatmore and Landstrom**	2011	Flood apprentices: an exercise in making things public	Economy and Society, Volume 40 Issue 4	2.5
Preparing and adapting homes to reduce flood impacts	**Harries**	2012	The anticipated emotional consequences of adaptive behaviour - impacts on the take-up of	Environment and Planning A, Vol 44, pp649-668	3

			household flood protection measures		
Preparing and adapting homes to reduce flood impacts	**Lamond et al**	2019	Supporting the uptake of resilient repair in the recovery process (FD2706): Final Report	London: Defra	2.8
Preparing and adapting homes to reduce flood impacts	**Joseph, Proverbs and Lamond**	2014	Resilient reinstatement: What can we learn from the 2007 flooding in England?	WIT Transactions on Ecology and the Environment, 184, 175-186	2.3
Preparing and adapting homes to reduce flood impacts	**Soane et al**	2010	Flood perception and mitigation: the role of severity, agency, and experience in the purchase of flood protection, and the communication of flood information	Environment and Planning A 2010, volume 42, pages 3023 ^ 3038	2.7
Preparing and adapting homes to reduce flood impacts	**Suykens et al**	2016	Dealing with flood damages: Will prevention, mitigation, and ex post compensation provide for a resilient triangle?	Ecology and Society	2
Preparing and adapting homes to reduce flood impacts	**Rose et al**	2016	Improving the uptake of flood resilience at the individual property level	International Journal of Safety and Security Engineering	2.7
Preparing and adapting homes to reduce flood impacts	**Owusu, Wright and Arthur**	2015	Public attitudes towards flooding and property-level flood protection measures	Natural Hazards	2.3
Preparing and adapting homes to reduce flood impacts	**Defra**	2014	Post-Installation Effectiveness of Property Level Flood Protection Final report FD2668 December 2014	Defra	2.3
Preparing and adapting homes to reduce flood impacts	**Harries**	2009	Review of the Pilot Flood Protection Grant Scheme in a Recently Flooded Area	Defra	2.3
Preparing and adapting homes to	**Orr et al**	2016	Pieces of Kit are not enough: the role of infrastructure in	E3S Web of Conferences, 7, 08009 (2016),	1.8

reduce flood impacts			community resilience	FLOODrisk 2016 - 3rd European Conference on Flood Risk Management	
Preparing and adapting homes to reduce flood impacts	**Twigger-Ross et al**	2015	Flood Resilience Community Pathfinder Evaluation Final Evaluation Report	Defra	2.7
Taking part in conversations about long-term adaptation	**Bennett-Lloyd et al**	2019	Fairbourne Coastal Risk Management Learning Project	Cardiff: Welsh Government.	3
Taking part in conversations about long-term adaptation	**Benson et al**	2018	Local flood risk management strategies in England: patterns of application	Journal of Flood Risk Management	3
Taking part in conversations about long-term adaptation	**Carpenter et al**	2018	Public perceptions of management priorities for the English Channel region	Marine Policy	3
Taking part in conversations about long-term adaptation	**Famuditi et al**	2018	Adaptive management and community reaction: The activities of Coastal Action Groups (CAGs) within the SMP process in England	Marine Policy	3
Taking part in conversations about long-term adaptation	**Fenn et al**	2015	Adapting to Coastal Erosion: Evaluation of rollback and leaseback schemes in Coastal Change Pathfinder projects: Final Report FD2679	Defra Joint Flood and Coastal Erosion Risk Management Research and Development Programme. Report prepared for Defra.	2.7
Taking part in conversations about long-term adaptation	**Fernández-Bilbao et al**	2009	Understanding the Process for Community Adaptation Planning and Engagement (CAPE) on the Coast R&D Technical	Joint Defra/ Environment Agency Flood and Coastal Erosion Risk Management R&D Programme	2.8

			Report FD2624/TR		
Taking part in conversations about long-term adaptation	**Fritsch**	2017	Integrated and adaptive water resources management: exploring public participation in the UK	Regional Environmental Change	2.3
Taking part in conversations about long-term adaptation	**Kelly and Kelly**	2019	Community engagement on climate adaptation – an evidence review	Environment Agency (From the project: Working together to adapt to a changing climate: flood and coast - FRS17192)	3
Taking part in conversations about long-term adaptation	**Maiden et al**	2017	Evaluation of the arrangements for managing local flood risk in England: Final Report	Defra Joint Flood and Coastal Erosion Risk Management Research and Development Programme	3
Taking part in conversations about long-term adaptation	**Moore and Davis**	2015	Cliff instability and erosion management in England and Wales	Journal of Coastal Conservation	1.8
Taking part in conversations about long-term adaptation	**Priest and Pardoe**	2012	Recommendations for flood mapping in England and Wales: Findings from the RISK MAP ERA-NET CRUE project	Environment Agency	2
Taking part in conversations about long-term adaptation	**Twigger-Ross et al**	2015	Community resilience to climate change: an evidence review	Joseph Rowntree Foundation	3
Taking part in conversations about long-term adaptation	**Young et al**	2014	Community driven coastal management: An example of the implementation of a coastal defence bund on South Uist, Scottish Outer Hebrides	Ocean and Coastal Management	2.6

Appendix C. Strength of evidence

For the assessment of strength of evidence the traffic light rating system was applied using the following criteria:

- RED - less than 2 empirical studies in the area which don't build on each other and provide very limited findings. Needs more basic research.
- AMBER - 3 or more studies focused on the same area but don't build on each other. Findings need more verification and connection across studies.
- GREEN - 3 or more studies that build on each other and form a clear body of work with findings that with some further work could be translated into practical action for risk management authorities (RMAs), for example, interventions or guidance/training.

The outcome of this assessment is presented in Table A.4 below.

Table A.4 Outcomes from strength of evidence assessment for each FCERM activity

	RQ1	RQ2	RQ3	RQ4	RQ5
Managing flood risk assets					
Preparing for, responding to and recording from incidents					
Taking part in decisions, designs and funding for schemes					
Managing land to achieve flood risk benefits					
Preparing and adapting homes to reduce flood impact					
Taking part in conversations about long term adaptation					

Appendix D. Gaps identified in the literature for each FCERM activity

Managing flood risk assets

A major gap in this review is the lack of consideration of the work of flood wardens and flood warden groups in any of the academic literature reviewed. There is some evidence within the grey literature but no focused work on flood wardens and their work.

There is a gap in the evidence about sustained engagement around flood asset management activities. Interviews carried out to understand the medium-term impacts of the Defra Pathfinders schemes found that many of the asset management initiatives that started or were documented in the Pathfinders were still in existence 2 years later (CECAN evaluation, unpublished, 2017), but no studies were found which examined these activities.

The research by Simm focused on smaller rural communities, mainly because this is where the direct-action self-help activity was most evident. It is unclear whether the models of participation would be transferable to urban or deprived communities, although these communities would be likely to be prioritised for government funded action, therefore making any local direct action unnecessary.

Another aspect that merits further research is the organisational form adopted by groups engaging in managing assets. The nature of this activity makes some form of organisational form advisable, in order to access insurance, get permits and authorisations, and to provide continuity as the membership of groups changes. However, there is very little information on organisational structures and how well different models work.

Preparing for, responding to and recovering from incidents

Evidence on preparing and responding to flood incidents is much better developed than it is on recovery and so there is a 'recovery gap'. Not much appears to be known about the flood recovery process, how people participate in it, and the barriers they face.

More needs to be known about what happens to members of the at-risk public in this phase (for example, how their lives are changed in adverse and, in some cases, beneficial ways) and how their resilience in recovery can be enhanced. There is evidence that the recovery process feels out of control for many; that it disrupts future lives and that there are considerable stress burdens. Significant mental health burdens are associated with recovery. Not enough is known about what may facilitate greater resilience and a less disruptive recovery and how people can be best engaged in the process.

Taking part in decisions, designs and funding for schemes

- Examining the extent of public participation in decisions and, in particular, the representation of their community in decisions.
- To what extent if decisions are communicated and able to be influenced by the wider community that is being represented by community groups.
- Detail of successful and unsuccessful approaches for decision making and influencing decisions on this FCERM activity.
- Costs and benefits for the public in participating in decisions.

Managing land to achieve flood risk benefits

Research on farmers' decision making on natural flood management (NFM) appears to be limited. This is supported by Holstead et al (2017), arguing that there is little discussion on this issue at a national scale as the existing research tends to be catchment specific. In addition, there is a need for new knowledge on how to tackle legacy 'lock-ins' that impede new approaches on NFM. Evidence on how these issues can be tackled to achieve the recognition and re-examination of views and expectations among those engaged in FCERM appears to be poorly understood. Boeuf and Fritsch (2016) suggest that more comparative studies in water management are needed to establish this knowledge.

There is evidence that little is understood of the tools and approaches that flood authorities need to help engage and work with farmers and landowners. Additionally, there are different perspectives and contexts on involvement with flood management presented in these studies. Not enough is known about whether there are generic perspectives common to all contexts. A toolkit of engagement strategies suitable for different perspectives also appears to be missing.

Preparing and adapting homes to reduce flood impacts

Further work with a large sample of people, together with a targeted intervention in relation to reinstatement, would be very useful to help further understand how to improve the uptake of resilience measures.

Understanding the relative importance of the emotional, social and governance aspects around uptake of PFR and their interactions is important in order to be able to focus on key variables that affect the uptake of PFR.

Further data collection is needed across the professionals involved in reinstatement and the place of PFR to validate the qualitative findings of Lamond et al (2019).

Evidence that explores how professionals engaged in PFR manage and cope with the emotional aspects of flooding is also needed.

Taking part in conversations about long-term adaptation

Benson et al (2018) suggest a need for further in-depth empirical research into LLFA strategy development to examine how these documents can be enhanced, particularly including the public in producing and implementing strategy. They argue that better engagement with the public is necessary for successful long-term implementation of flood and coastal erosion risk management (Benson et al, 2018).

Kelly and Kelly (2019) identify that research is needed into the challenges associated with adapting to severe climate change impacts, specifically where communities face potential relocation. They particularly emphasise that the challenges associated with place 'detachment' (Nicolosi and Corbett, 2017) and forming attachments to altered or completely different places is an aspect of climate change adaptation that needs further attention (Quinn et al, 2015 cited by Kelly and Kelly, 2019).

Appendix E. Gaps identified by expert interviewees

The following gaps were highlighted by the interviewed experts:

- More research is required to understand how to get the right people in place before flooding occurs. It was pointed out that 'you can't get them with leaflets'.
- It was stressed that there is a need to understand how to develop trust in people and not just rely on tools and technologies. Valuing experiential knowledge – the interviewee cited lots of conversations they have had about lay knowledge and how this doesn't fit with models produced by RMAs, and that they are not linked together. It was suggested that more work is required to build knowledge of how to work together around the technical flood process.
- Discussing the different types of barriers and facilitators for public participation, there is an existing gap in showing the importance of having skills for engagement as well as showing the difference that can be made by having engagement as a bolt on versus funding it properly and having it as an integral part of the process.
- It was suggested that the research on the main costs and benefits of public participation is not good in terms of engagement, for example, the benefits of early engagement.
- In light of the types of governance and institutional arrangements that facilitate or inhibit public participation, the expert identified a key gap in relation to how different words are understood and what impact that has on good engagement.
- There is a lack of good research evidence on similarities and differences in participation across the 6 FCERM activities, but it was suggested that ultimately people are impacted and there are commonalities around psychology and coping and engagement, home and locality and the emotional impacts.
- There is also a lack of good research evidence for understanding where members of the public are most engaged in relation to the 6 FCERM activities.
- It was noted that there isn't much research or evidence on hostility towards NFM from the general population.
- Other research gaps included: how to introduce and communicate about uncertainty; context of NFM – if it is part of a bigger scheme how does that affect how people respond to it. – If NFM is part of broader package of FCERM, this may affect how people respond to it.
- It was highlighted that there isn't good research evidence on the main costs and benefits of public participation for NFM. In particular, more research is needed on formative evaluations of ongoing processes. Rather than being asked 5 years later if it [NFM intervention] was good, having integrated research, to track it as it goes along, needs to be built in from the start.
- It was stressed that there isn't good research evidence on what types of governance and institutional arrangements facilitate or inhibit public participation in NFM. It was suggested that this could be due to sensitive and contentious issues that are political and potentially critical of institutions.

- It was emphasised that there is slim evidence on communities managing land to achieve flood risk benefits. Particularly, there is a lot of conflict in statements about whether different land management can reduce flood risk – no national evidence – local/catchment but cannot be rolled out nationally.
- The gaps in evidence on NFM are at a national level as it is currently catchment specific. Can this therefore be applied at a national level? Another question that needs exploring is: has it worked well locally because key players have kept it going and it might not work in other areas.
- Other evidence gaps discussed included looking at a definition of 'place-based resilience' and what this resilience looks like.
- From and economic perspective there is a gap related to economic costs and agriculture.
- There is a relationship between communities developing an understanding of flood risk from the ground up and their ability to link with the broad-based assessment and modelling being done by the authorities. The expert was not clear how much information or evidence there is about this.
- The expert thinks that there isn't good evidence in this area generally (in other words, where and in what ways are the public most engaged across the different FCERM activities). The expert referred to the provided definitions as part of this review and suggested that these are mostly used interchangeably. There has not been much research where engagement in the context of flooding is the key focus, but rather it is often examined as an add on. In addition, the expert suggested that there is sociological research on individuals and behaviour change, but this focuses on why people join groups and less on flood risk specifically.
- A key gap discussed was about understanding sustainability of groups. It was noted that very little research looks at long-term engagement. Where funding is available, people will engage (for example, rain gardens), but in time people people then walk away. It is the same for property flood resilience (PFR) – the professionals say that unless people practice using their PFR every year it gets put away into the garage and forgotten about. So, it seems that even when taking ownership of assets (PFR) there needs to be a sense of social norms and community to help maintain engagement.
- It was suggested that research and academic literature appears to focus on successes, and failures tend not to be reported. It was suggested that it would be worthwhile to look at approaches that have not worked.
- The gaps on different types of barriers and facilitators for public participation discussed included: Understanding how people are persuaded who the key influencers are; understanding more about the facilitators for people joining groups, and how groups can reach out to others in their communities to influence neighbours and 'prove' that PFR works?
- It was indicated that there is a research gap in terms of the costs of setting up groups – not collated and hidden.
- A key gap identified would be to look at the role of identity theory.
- It was suggested that SMEs are not understood well enough and it would be good to have more information on this.
- It was suggested that how emotions fit in is still not really known – what happens to anger? Why are some people ostracised?

- It was noted that there was no systematic analysis of pilots that has pulled together what works and what doesn't work with respect to PFR.
- It was suggested that little is known about how decisions are made in the insurance sector and by actuaries and loss adjustors. More information is needed about the relationships between the different players - they are having to balance between 'doing good' and making a profit and keeping their reputation.

Appendix F. Initial list of identified gaps by research team

1. How many cases of individual members of the public and groups working with RMAs are there in each of the FCERM activities? What is their nature and how effective are they? How can their successes and challenges be shared? This could take the form of a database with specific templates that could be filled in and self evaluated.
2. Who is participating/engaging in FCERM across the 6 FCERM activities covered in this review? Anecdotally, it is thought to be older, more affluent, educated people, but there was no clear evidence for or against this.
3. What does 'sustained engagement' look like for all types of group and engagement, what factors influence it, what makes it resilient, and how is effectiveness measured?
4. How do flood groups operate in practice? It was felt that there is research on why and how people get engaged with groups, but little on how they work and how decisions get made.
5. How is representation of individual members of the public enacted in FCERM decision making through flood groups? In what circumstances are flood groups seen as representative by communities and by RMAs? What links do flood groups have/make with wider networks?
6. What are the links between representative democracy (the political process) and participative democracy in relation to FCERM? How do these interact?
7. How do different types of engagement/participation influence FCERM decision making? What are the mechanics of those processes? Who decides who gets included/excluded? What is the role of 'lay expertise'?
8. What is the relationship between formal consultation processes, for example, on new developments that have implications for flooding, and participative engagement through flood groups? How can formal consultation processes be opened up to allow more individual members of the public and groups to participate?
9. How are individual members of the public and groups engaging in flood recovery? What types of activities and actions are they carrying out? How can those activities be supported to increase personal resilience within the recovery process, specifically for people who are relocated?
10. How do professionals engaged in PFR in reinstatement manage and cope with the emotional aspects of flooding? What training and support might be appropriate for them in order to engage effectively with individual members of the public and groups during recovery?
11. What are the processes for farmers' decision making on NFM? What are the factors that contribute to their decision making?
12. What tools and approaches do RMAs need to help engage and work with farmers and landowners, specifically around NFM?
13. What are the challenges associated with place detachment and forming attachments to altered or completely different places – is this an aspect of climate change adaptation?

14. While there is information on the social and psychological costs and benefits for individual members of the public and groups as well as RMAs from participation in FCERM activities, there is still a lack of evidence of the financial costs and benefits.

15. What are the characteristics of institutions (for example, RMAs) that facilitated engagement with individual members of the public and groups? How can these be developed?

Appendix G. Gaps identified by Jan 2019 workshop

Managing flood risk assets

- What is the level of ambition for this to happen, on what scale?
- How would this link to resilience/standard of protection standards?
- Which processes and procedures will enable community management of assets routinely?
- What are the training and guidance needs both for community groups and FCERM staff?
- What kinds of assets are in scope for this?
- Do needs and ways of doing this differ for different flood or urban/rural contexts?
- What are the different authorities' approaches and perspective on this and how does that affect likely success?
- How does community maintenance activity work within a catchment-based approach?
- How does quality control of community activity need to work, and what happens in the event of performance failure?

Preparing for, responding to and recovering from incidents

- How can the public currently contribute to incident management and response, including learning from spheres of incident management and response that achieve greater public participation than FCERM?
- Do we need better clarity over roles and responsibilities between authorities and communities during a flood?
- Is state support for voluntary groups the best way to operate during incidents?
- Do cultural and behavioural aspects of the Civil Contingencies Act limit participation in incidents?
- Do we need consistency in volunteer involvement in incidents?
- Would an absence of social capital in certain areas mean a completely different approach is required?
- What is small or medium-sized enterprise (SME) involvement in incidents and what could it be?
- Who is best placed to co-ordinate volunteer involvement in incidents?
- Do we learn from overseas' approaches to community engagement in incidents?
- How do we embed a sense of place into community engagement in incident response?
- How important are different styles of command and control on community/partner response and working?
- What is the most effective way of working with community volunteers during events? And where in the incident management cycle would it work best?

- How should LRFs build in volunteers into their emergency planning?

Taking part in decisions, designs and funding for schemes

- What are public and communities' perceptions of the current risk management plans and policies?
- How can the public currently contribute to flood management across the full spectrum of flood risk types and activities, including but not confined to:
    - home purchase (or property rental), property flood resilience and insurance
    - scheme funding and decision making
- Where participation in interventions does not work well, how can social research be used to create guidance and suggest new operational practice, communications or engagement to improve participation.
- Where culture or participation barriers cannot be addressed by using available research or where barriers are systemic, the research will suggest appropriate measures to remove issues.
- Should we adopt a resilient standard approach set out by the National Infrastructure Commission?
- How can community resilience be enhanced?
- Do we need to engage earlier with people and not be scheme led if we were to run engagement as a relationship building activity and not a project activity.
- How many schemes are on hold due to poor engagement and how much is this costing (or has this cost in the past?)
- Are outcome measures a barrier to engagement?
- Is a project approach to engagement fundamentally wrong?
- What are the best windows of opportunity for engagement?
- What should the measures of success for engagement be?
- When is the best time to engage?
- What are the consequences of engaging too late?
- How does this type of engagement link to wider conversations, about regeneration for example?
- Should schemes link better with local flood groups, or does this happen routinely?
- Should engagement be part of capital infrastructure investment?
- Representativeness of flood groups and inputs into schemes - what is the impact of group representation?
- What is a representative community? What is a proper sample of a community?

Managing land to achieve flood risk benefits

- How do we manage the issue of FCERM interventions away from communities benefitting from those interventions (catchment approaches)?
- How do we create resilient places?
- Does land ownership affect the extent to which management can be adapted for different benefits?
- What is the best way of using citizen science across land management and flood risk (for example, to understand flow pathways)?
- Regarding land management, how do we define the 'community'?
- Are we equally addressing urban land management alongside rural land management?
- What is the impact of land management change (through agricultural policy change or use of net gain) on flood risk and what is the community perception and response to this?

Preparing and adapting homes to reduce flood impacts

- What is the best policy response for unprotected communities?
- What do we know about communities' response in cases where communities or homes may need to be sacrificed (e.g. due to high levels of flood or coastal erosion risk)?
- What response do people renting and landlords have to property flood resilience (PFR)?
- Would authorities' engagement be more effective if it focused on all parts of the community, and not just those people who are easily accessible?
- To what extent are people prepared to take on the responsibility of protecting their own homes from flooding (interview with expert no.7)?
- Do we need independent assessments of the need and value of PFR and certification of the implementation chain?
- How should we prioritise engagement with communities on PFR?
- Do we have evidence of the suitability of PFR in different flood or location contexts?
- What is the social contract for PFR?
- What opportunities are there to improve uptake?
- What are people's perspective of what PFR does to your home?
- What are the liability issues if PFR is installed and failing; and how does liability work for landlords and tenants?
- Which interventions and incentives work best in different geographic contexts or socio-economic contexts?
- What is the best way to link personal resilience to PFR and would that be a helpful approach?

Taking part in conversations about long-term adaptation

- What does sea level rise data mean to communities, and how could or would communities plan and respond?
- How would understanding uncertain futures, such as the difference between confident or less confident scenarios, change communities' perceptions of the future?
- What is the public's perception of its role and the role of authorities in developing an adaptation plan for future flood risk?
- What is the public's ability and capacity to adapt?
- Are communities ready or what do they need to be ready to adapt?
- What capability do authorities have to support and engage with communities?
- What are public and communities' perceptions of the current risk management plans and policies?
- When might a community become unsustainable due to flood and/or coastal erosion risk? How can we use the UK Climate Projections 2018 (UKCP18) data and what are the thresholds for sustainability?
- What does success in this kind of engagement look like?
- What do we mean by long-term adaptation?
- Spatial planning changes since the loss of regions means a shift in favour of development, and incremental changes do not help with adaptation? Do we know the impact of this?
- What do we understand about social contracts and long-term adaptation?
- What are the mental health implications of long-term change and uncertainty? And who leads on that issue?
- Are strategic FRMPs effective at creating the right plans, the right engagement planning and the right conversations?
- What is meant by long term?
- How are communities responding to existing sea level rise estimates? Have communities used this data in any way?
- What can we learn from an open dialogue with communities that have/haven't adapted to a long-term future risk?

Appendix H. Summary of discussion of criteria for prioritising gaps

Group 1. Environment Agency

Group 1 participants felt that several of the gaps/questions were linked and that there is an order in which the resulting research needs to be carried out.

The participants in group 1 felt that gap 11 was a sub-part of gap 3. They rated these the highest priority (and categorised as 'must') along with gap 12 and gap 6. Gaps 1 and 2 were also considered by participants to be closely linked. Gaps 1 and 2, 7 and 8 were all also categorised as 'must', but given slightly less priority than gaps 3 and 11, 12 and 6. Gap 10 was categorised as 'should', but participants felt that the questions should be reframed and tackled at a later stage. They felt that research on trust in RMAs is needed before this question is addressed. Gap 9 was rated the least priority and categorised as 'won't' because participants felt that this gap is broader than the scope of the communities R&D framework.

Group 2. Academics and researchers

During the prioritisation process, the participants in group 2 considered where they felt there are gaps in data/evidence, but also which gaps had the most societal importance. In their analysis of the gaps, the participants chose to group together gaps 5 and 6 as one overall gap looking at health and wellbeing (including mental health). The participants felt some gaps, such as gap 8, were important but that research already exists that could answer those questions.

Gaps 2 and 4 were prioritised as most important and categorised as 'must'. Participants felt that gap 2 (sustained participation) is also about recognising change is happening over time (for example, climate change) and that sustainability itself has value. In regard to gap 4, they felt that there is already some evidence on tools to engage farmers and landowners in NFM from which information can be taken, but that a lot more work needs to be done.

Gaps 1, 7, 9 and 12 were considered least important and categorised as 'won't' because participants felt that the research is already available to answer these questions. For gap 12 (costs and benefits), the group participants gave it lower priority specifically because of the use of the term 'financial'. They felt that the question would be better framed without including 'financial', to include all types of costs and benefits.

Group 3. Other practitioners

The participants in this group felt that many of the key topics found in the gaps had already emerged in earlier discussions during the workshop. In their discussion, the participants expressed concern that this type of work often does not reach communities. They also discussed the issue of dissemination. Participants stressed the importance of communicating the accumulated knowledge during this process nationwide, while acknowledging the different contexts communities find themselves in.

During the prioritisation process, the participants suggested some gaps be merged or rephrased. For example, it was suggested to group together gaps 7 and 9 as a gap looking at transparency of the decision-making process and community's awareness of its influence as part of that. It was also proposed that gaps 5 and 6 should be merged. For other gaps, such as gap 3, participants suggested that rephrasing 'flood recovery' by focusing on 'revisiting/learning' could help access community knowledge. This gap

was considered to capture the key feedback process of what worked and what didn't in the community engagement practice.

By applying the MoSCoW prioritisation technique participants listed gaps 2, 3, 8 and 7/9 (as merged) as 'must'. The importance of gap 8 was justified as it highlights the role of communities and their presence 'around the table' in the decision-making process. Gaps 1 and 4 were listed as least important and categorised as 'won't'. For gap 1 this was due to the financial and time resource required to address it.

Summary of plenary discussion

During the plenary session, one participant from each breakout group reported back to the whole group which gaps their group had rated as top priority and categorised as 'must', and which gaps they had prioritised as lowest priority and categorised as 'wont'.

It was clear from the plenary discussion that there was some discrepancy between the groups regarding how important they felt some of the gaps were. For example, gap 12 (costs and benefits of participation) was rated top priority by participants from the Environment Agency (group 1), whereas the researchers and academics in group 2 categorised it as 'wont'. Meanwhile the group of other (non-Environment Agency) practitioners (group 3) categorised gap 12 as 'could'. Group 2 didn't like how the question was framed to only include 'financial' costs and benefits as they felt there are other ways to measure costs and benefits. Group 1 participants prioritised this gap as they felt there is a need for a quantitative/financial proxy of costs and benefits to be able to put research into practice. It is difficult to integrate non-financial costs and benefits into practice/decision-making, therefore this is a potential research gap to be addressed.

All groups listed gap 2 as a 'must' and 2 of the 3 groups listed gaps 3, 7 and 8 as 'musts'.

A second potential evidence gap identified during this plenary discussion was research into multi-agency flood responses and how best practice within other sectors impacts how things are done by flood authorities. For example, best practice from the police being translated into flood response can lead to challenges.

Another gap that was felt to be missing from the list was the topic of partnerships. In particular, how partnerships can change according to the different players involved and how there may be risks and benefits associated with these changes. This should be brought into the equation as there may be interesting research questions related to this.

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