CREW CENTRE OF EXPERTISE FOR WATERS

Reducing the mental health and wellbeing impacts of flooding: Informing cross-policy action in Scotland

Claire Niedzwiedz, Rhian Thomas, Chiara Hill-Harding, Mhairi Campbell, Thomas Rochow, Hannah Salamon, Fiona Henderson

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List of Abbreviations

aOR Adjusted odds ratio

BAETULO Badalona Integrated Early Warning System (LIFE BAETULO project)

CBT Cognitive behavioural therapy

CCRA4 Fourth Climate Change Risk Assessment

Cfb Köppen–Geiger temperate oceanic climate classification

C40 Cities Climate Leadership Group

CINAHL Cumulative Index to Nursing and Allied Health Literature

CI Confidence interval

DDR Disaster Risk Reduction

EBSCOhost Elton B. Stephens Company (research database platform)

EconLit Economics literature database

ECCC Environment and Climate Change Canada

EEA European Environment Agency

FCERM Flood and Coastal Erosion Risk Management

FHIMP Flood Hazard Identification and Mapping Program

GAD Generalised anxiety disorder

GHQ General Health Questionnaire

GIRFEC Getting It Right For Every Child

GP General Practitioner

HIA Health Impact Assessment

HiAP Health in All Policies

HNAPs Health National Adaptation Plans

HSCP Health and Social Care Partnerships

IASC Inter-Agency Standing Committee

LDP Local Development Plan

LIFE EU's funding instrument for the environment and climate action

MBIE Ministry of Business Innovation and Employment

MEDLINE Medical Literature Analysis and Retrieval System Online

MHPSS Mental Health and Psychosocial Support

MMAT Mixed Methods Appraisal Tool

NAPs National Adaptation Plans

NBS Nature-based Solution

NEMA National Emergency Management Agency

NFM Natural Flood Management

NRCan Natural Resources Canada

NRW North Rhine-Westphalia

NHS National Health Service

NZ New Zealand

OECD Organisation for Economic Co-operation and Development

OR Odds ratio

OSF Open Science Framework

PFA Psychological First Aid

PHQ Patient Health Questionnaire

PHS Public Health Scotland

PICO Population, Intervention, Comparator, Outcomes framework

PRISMA Preferred Reporting Items for Systematic Reviews and Meta-Analyses

PRISMA-ScR PRISMA extension for Scoping Reviews

PSC Public Safety Canada

PTSD Post Traumatic Stress Disorder

RAMHP Rural Adversity Mental Health Program

RCT Randomised Controlled Trial

SEPA Scottish Environment Protection Agency

SWB Subjective wellbeing

SWiM Synthesis Without Meta-analysis

UK United Kingdom

WHO World Health Organization

Glossary

For this glossary, in places where a generic term is defined, an example of how the term is used in the context of flooding and mental health is given.

Acute response phase
The immediate period during and directly after a flood event when emergency services and communities focus on safety, evacuation, and urgent support.

Adaptation
Actions taken to adjust to the effects of climate change in order to reduce harm or manage future risks. In the flood context, this refers to actions taken to reduce the severity or impact of flooding (e.g. flood barriers, raised electrics).

Agency (sense of agency)
A person's feeling of control over their life and ability to influence what happens to them. For example, flooding can reduce this sense of control, affecting wellbeing.

Anticipatory stress
Worry or anxiety experienced in advance of a possible harmful event, such as concern about future flooding.

Chronic stressor
An ongoing source of stress that persists over time (e.g. repeated flooding or prolonged uncertainty about risk).

Coastal flooding
Flooding caused by rising sea levels, storm surges, or high tides affecting coastal areas.

Cross-policy action
Coordinated action across different government sectors (e.g. health, housing, environment, planning) to address complex issues.

Cumulative exposure
The total exposure to something that is accumulated over time. For example, the repeated experience of flooding over time, which can increase the risk of mental ill health.

Digital mental health intervention
Mental health support delivered through online platforms or apps rather than face-to-face services.

Displacement
Being forced to leave one's home temporarily or permanently, for example due to flood damage or risk.

Downstream intervention
An action taken to address the effects or consequences of an issue after it has occurred, rather than tackling its root causes. For example, counselling a number of months after a flood has taken place.

Early warning system
A system that provides advance notice of hazards (e.g. flood alerts), allowing people and services to prepare and reduce harm.

Equity-focused intervention
An approach that provides additional or tailored support or resources to groups that have different levels of need (e.g. low-income households, older adults, disabled people, children) in order to achieve the same outcomes.

Flood Mitigation
Actions that reduce the likelihood or magnitude of flooding, such as structural engineering or natural flood management.

Flood resilience
The capacity of individuals, communities, and systems to anticipate, cope with, recover from, and adapt to flooding while minimising long-term damage.

Fluvial (river) flooding
Flooding that occurs when rivers or streams overflow their banks onto surrounding land.

Hazard
A potentially damaging event or situation (e.g. heavy rainfall, storm surge).

Health inequalities
The unjust and avoidable differences in people's health across the population and between different population groups[1].

Health in All Policies (HiAP)
An established, preventative approach to improving health and health equity that involves working across all areas of the public sector (e.g. housing, transport, education, environment) to consider how decisions might affect people's health.

Implementation gap
The difference between what policies intend to achieve and what actually happens in practice.

Intention–behaviour gap
The difference between what people say they plan to do (e.g. install flood protection) and what they actually do.

Mental health
Part of our overall health, alongside our physical health. It is what we experience every day, and like physical health, it ebbs and flows daily. Good mental health means we can realise our full potential and feel safe and secure. It also means we thrive in everyday life[1].

Mental illness
A health condition that affects emotions, thinking and behaviour, which substantially interferes with or limits our life. If left untreated, mental illnesses can significantly impact daily living, including our ability to work, care for family, and relate and interact with others[1].

Mental wellbeing
Our internal positive view that we are coping well psychologically with the everyday stresses of life and can work productively and fruitfully .

Multi-agency approach
Collaboration between different organisations (e.g. health services, local authorities, emergency services, voluntary sector) to coordinate support.

[1] Consistent with the 2023 Scottish Government Mental Health and Wellbeing Strategy

National adaptation plan
A national strategy outlining how a country will prepare for and respond to climate change impacts. Health National Adaptation Plans (HNAPs) focus specifically on health impacts.

Nature-based solutions (NBS)
Actions that protect, manage, and restore ecosystems to address societal challenges, like climate change, while providing wellbeing and biodiversity benefits. For example, wetlands, woodlands, green spaces which reduce flood risk while also providing environmental and wellbeing benefits.

Operational capacity (policy context)
The practical ability of organisations or systems to deliver services effectively (e.g. staffing, funding, coordination).

Place attachment
The emotional bond people have with their home or community. Flood damage can disrupt this connection.

Place-based approach
An approach that tailors interventions to the specific characteristics, needs, and strengths of a local area.

Pluvial (surface water) flooding
Flooding caused by heavy rainfall overwhelming drainage systems, leading to water accumulating on the ground surface.

Preparedness (flood context)
Flood preparedness involves risk assessment, emergency planning, property flood resilience measures, access to information and warnings, insurance and community action. Effective preparation operates at individual, community and institutional levels to ensure faster recovery.

Prevention (flood context)
Actions taken before flooding occurs to reduce the likelihood of flooding happening at all, or to avoid exposure to flood risk. For example, avoiding development in flood-prone areas or relocating assets out of risk zones.

Prevention (public mental health context)
Actions that protect, promote, and sustain positive mental wellbeing while reducing the risk of mental health problems across populations.

Protective factor
A condition or attribute that reduces the likelihood of poor mental health outcomes (e.g. strong social support).

Psychological distress
General emotional suffering that may include anxiety, low mood, or difficulty coping, but does not necessarily mean a clinically diagnosable illness.

Psychological First Aid (PFA)
A supportive and practical approach delivered immediately after a distressing event to stabilise distress and connect people to support.

Psychosocial support
Support that addresses both psychological needs (thoughts, emotions) and social needs (relationships, community connection).

Randomised Controlled Trial (RCT)
A research study in which participants are randomly assigned to receive an intervention or not, to test whether it works.

Recovery (flood context)
The period after a flood event focused on rebuilding homes, restoring services, and supporting emotional and social recovery.

Resilience
The ability to cope with, adapt to, and recover from difficult experiences.

Risk communication
Providing clear, timely, and understandable information about hazards to help people make informed decisions.

Secondary stressor
Stress caused not directly by the stressful event itself but by its consequences (e.g. insurance disputes, housing issues, financial strain after a flood occurs).

Service continuity
The ability of essential services (e.g. healthcare, pharmacies, social care) to continue operating, e.g. during and after a flood.

Social capital
The networks, trust, and relationships within a community that enable people to support one another.

Social vulnerability (flood context)
How societal, cultural, economic, and institutional factors shape the ability of individuals, groups, and communities to cope with flooding. Socially vulnerable populations often experience disproportionate harm due to increased exposure to hazards, greater sensitivity (due to factors such as age, or pre-existing health conditions) and less adaptive capacity (e.g. fewer finances, resources).

Structural intervention (flood context)
In the context of this work, a structural intervention refers to a change to physical infrastructure or the built environment (e.g. levees, green flood storage areas) designed to reduce flood risk.

Systems thinking
An approach that considers how different parts of a system (e.g. housing, health, environment, finance) interact rather than addressing issues in isolation.

Trauma-informed approach
A way of delivering services that recognises the impact of trauma and avoids actions that may unintentionally cause further distress.

Upstream intervention
An action that addresses root causes of harm (e.g. housing quality, income security) rather than only responding after damage occurs.

Executive Summary

Background

Flooding is a major climate-related health risk in Scotland, with impacts on mental health and wellbeing that can persist for years after floodwaters recede. Scottish policy frameworks emphasise the role of climate change as a significant and growing driver of health inequalities and call for coordinated, cross-sector action to reduce harm from adverse weather events. Despite this commitment, the evidence base for interventions (e.g. property-level and community interventions) which address the mental health and wellbeing impacts of flooding remains limited. To address this, and in light of forthcoming policy developments linked to the Fourth Climate Change Risk Assessment (CCRA4), this study conducted a comprehensive review of a broad range of interventions, a policy review, and policy mapping.

Purpose of Research

The aim was to identify effective cross-policy actions in Scotland which help to mitigate the adverse mental health and wellbeing impacts of flooding, including coastal change, through a systematic review of the literature (Workstream 1) and a desk-based policy review and mapping (Workstream 2).

Workstream 1: Research questions

1. What interventions – socio-economic, health, property, nature-based, and community – can mitigate the negative mental health and wellbeing impacts of flooding?
2. How applicable and effective are these interventions in Scotland for different groups, particularly those at higher risk of flooding and poorer mental health outcomes?

Workstream 1: Key findings

Evidence base and study characteristics

- Twenty-eight studies were identified, which were predominantly observational and focused on recovery after a flood, with limited evidence on adaptation, preparedness and response phases (Figure 1 shows the types of interventions considered).
- The methodological quality of the included studies was variable.
- Evidence was largely from England and Wales; no studies were conducted in Scotland.
- Vulnerable groups (e.g. people with disabilities, low-income households) were under-represented across the studies.
- More work is needed to understand how different measures, like home adaptations or community support, can help reduce the risk factors for poor mental health outcomes before, during and after flooding.

Effective interventions and protective factors

- Property flood resilience measures were associated with improved perceived safety and reduced long-term mental health deterioration.
- Early warning systems providing alerts more than 12 hours before the event were associated with reduced adverse mental health outcomes by enabling timely action and reducing feelings of helplessness.
- Community social capital (e.g. strong social networks) was protective against adverse mental health outcomes post-flooding, but cohesion can deteriorate over time when recovery processes are perceived as unfair or institutional support declines prematurely.
- Psychosocial interventions (e.g. digital mindfulness, counselling), may help to improve mental health and wellbeing during the recovery phase when tailored to individual needs.

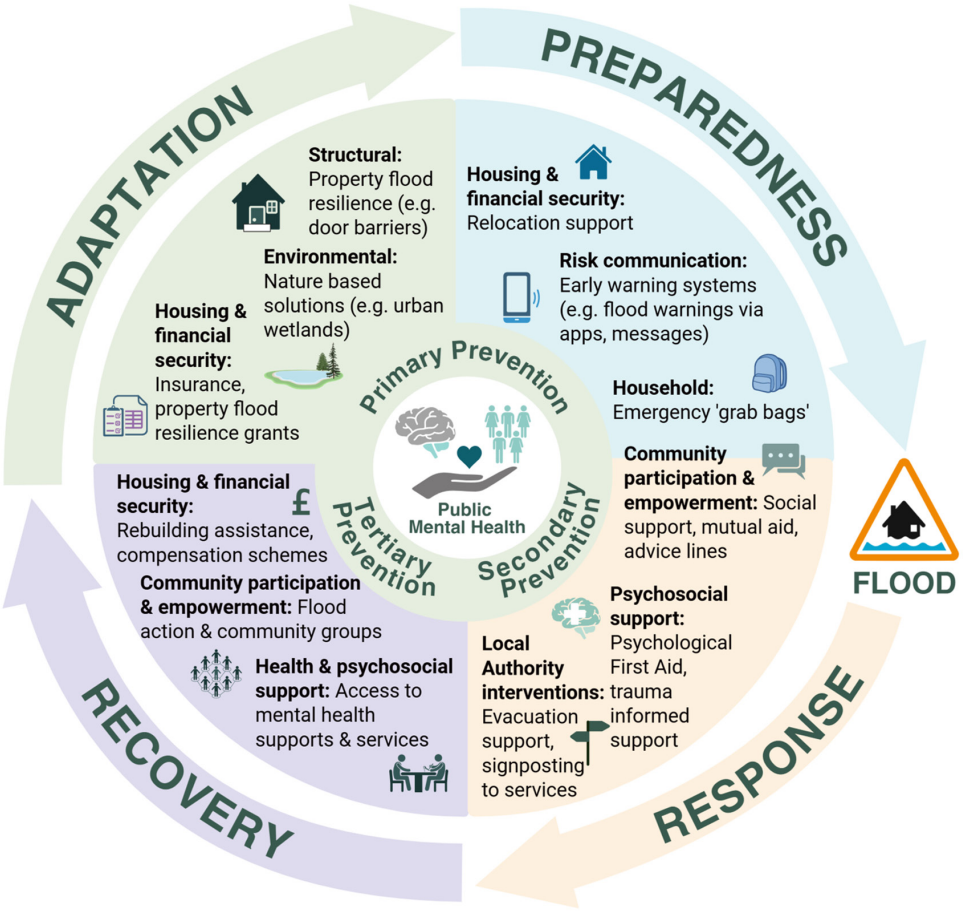

Figure 1: Infographic summarising the different types of interventions reviewed, ordered according to stage along the flood resilience and public mental health pathways[2].

Workstream 2: Research questions

1. What cross-policy actions are being implemented in countries with similar geographic and socio-economic characteristics to Scotland to mitigate the negative mental health and wellbeing impacts of flooding?
2. How can policy areas in Scotland better connect and coordinate to address the mental health and wellbeing impacts of flooding?

Workstream 2: Key findings

Policy Landscape

- Most countries have no to little inclusion of mental health actions in their national climate adaptation policies.
- Nine categories of cross-policy actions/ interventions were identified within case studies (Figure 2).
- Direct evaluation of existing cross-policy actions in mitigating the adverse mental health and wellbeing impacts of flooding, is limited.

What effective cross-policy action might look like

- A shift from reactive, siloed responses to integrated, adaptive, place-based systems treating flood adaptation as both a climate and public mental health priority. This will require sustained commitment and system-wide buy in, with clear roles and responsibilities defined.
- Core components include: a Health in All Policies approach embedding mental health and wellbeing across sectors; meaningful community participation in planning and decision-making; integrated recovery with housing, financial security and mental health addressed together; place-based approaches tailored to local flood risk, community assets, and population needs.

Scotland's Position

- Scotland is well positioned to adopt an integrated, place-based and people-centred approach as this aligns more broadly with existing commitments, governance structures, policies and climate and health strategies

[2]Created in BioRender. Niedzwiedz, C. (2026) https://BioRender.com/mrrzddh. Flood alert icon from Environment Agency, licensed under the Open Government Licence v3.0.

Figure 2: Nine categories of cross-policy interventions.

(e.g. the Place Principle; Community Empowerment (Scotland) Act 2015; Flood Resilience Strategy; Population Health Framework; Community Wealth Building Act 2026).

- Initial policy mapping highlighted varying levels of interconnectedness between Scottish strategies and policies that require stronger coordination.

Overall Recommendations

The findings from the complementary Workstreams above support the policy and research recommendations below *(see section 4 for the detailed recommendations)*.

Policy

- **Embed consideration of mental health and wellbeing within flood preparedness and planning systems:** Integrate mental health and wellbeing messaging and service signposting into SEPA alerts and Local Flood Risk Management Plans; optimise early warning systems; and incorporate mental health and wellbeing indicators into planning and adaptation frameworks to support future upstream prevention.
- **Strengthen trauma-informed and early response capacity:** Embed Psychological First Aid and trauma-informed training within civil contingencies planning through, for example, developing a national flooding and public mental health communication toolkit to support frontline staff and community organisations.
- **Reduce post-flood secondary stressors:** Strengthen coordination between housing, insurance, welfare, and health services during recovery to mitigate mental health impacts; and implement proactive support for displaced households and vulnerable groups.
- **Invest in equitable, long-term resilience:** Offer property-level flood resilience grants in high-risk areas; develop targeted support pathways for potentially vulnerable groups with greatest need (e.g. people with pre-existing long-term health conditions); sustain community resilience programmes; ensure timely access to mental health support and services where required; and design and promote multi-functional green/blue infrastructure delivering mental health co-benefits.

Research

- **Strengthen longitudinal monitoring systems:** Integrate routine flood, health and social data to facilitate timely, short- and long-term monitoring and research of mental health and wellbeing outcomes related to flooding.
- **Build causal evidence for adaptation and equity-focused interventions:** Increase Scotland-based quasi-experimental and natural experiment evaluations to address critical evidence gaps and support cost-effective, equity-focused investment decisions.

1.0 Introduction

1.1 Background and Scope

Scotland's climate has seen a warming trend, shifting rainfall patterns, more extreme weather events and rising sea levels. Climate change is increasing our exposure to fluvial, pluvial and coastal flooding in Scotland. Winter rainfall is expected to increase (by ~7% by the 2050s; up to 13% by 2080s) which is projected to lead to an increase in the likelihood of fluvial and pluvial flooding (Sniffer, 2021). Sea level is expected to rise (by ~12-18cm by the 2050s and 23-54cm by 2080s) leading to an increased likelihood of flooding of coastal communities (Sniffer, 2021).

Flooding from all sources poses a significant risk to people, communities and the built environment in Scotland and is one of the most important climate change challenges we face (Scottish Government, 2024a). Flooding can negatively impact physical health, as well as mental health and wellbeing (Alderman et al., 2012; Thomas and Niedzwiedz, 2024). Among the most significant health impacts of flooding in the UK are those on mental health, with people who experience flooding at higher risk of depression, anxiety and post-traumatic stress disorder (PTSD) (Waite *et al.*, 2017). In addition, those with pre-existing mental and physical health conditions may have reduced capacity to prepare for future flood events (Henderson *et al.,* 2022, 2026), potentially exacerbating mental health impacts. The few existing studies that have looked at the impacts of flooding in Scotland specifically found impacts on both physical and mental health (Werritty *et al.,* 2007), with long-term (>3 years after the flood) consequences on wellbeing (Philip *et al.*, 2020).

Negative mental health outcomes can occur via direct pathways (e.g. trauma) and indirect pathways (e.g. impacts on diet, livelihoods, social networks or displacement) (Gieve *et al*., 2025; Niedzwiedz *et al*., 2025). Groups identified as particularly vulnerable to flooding include those living on low income, minority ethnic groups, older people, women, and those living with disabilities and long-term health conditions (Brisley *et al*., 2012; Philip *et al*., 2020; Werritty *et al*., 2007). Social vulnerability (i.e., higher susceptibility to flooding exposure with often limited capacity to mitigate and adapt to flooding effects) is also often higher in deprived areas (Kazmierczak *et al*., 2015; Sayers *et al*., 2023). Resilience to, and effective recovery from, flood events depends not just on interventions such as physical protection measures, but also on mental health and wellbeing support before, during and after floods. Scotland's National Flood Resilience Strategy (Scottish Government, 2024a), as part of Scotland's National Adaptation Plan (Scottish Government, 2024b) and wider Just Transition commitments aim to respond to this challenge.

The Fourth Climate Change Risk Assessment (CCRA4), to be delivered in 2026, will provide an updated assessment of the risks from climate change, including flooding and the potential for adaptations to address them. This is likely to require the need for cross-policy development to address the links between climate and health, and provide evidence for policy and practice. This project directly addresses these needs, with the primary aim to develop an understanding of effective cross-policy actions that could be implemented across the flood pathway from adaptation, preparedness, response and recovery in Scotland to lessen the negative mental health and broader wellbeing impacts of all types of flooding. Outputs will support Scotland's Population Health Framework (Scottish Government, 2025), the aim of which is to improve population health and reduce inequality, and Public Health Scotland's Adverse Weather and Health Plan (Public Health Scotland, 2024), which has committed to minimise the health harm caused by adverse weather in Scotland, as well as other adaptation and flood resilience planning and emergency responses.

1.2 Project Objectives

Two complementary Workstreams addressed following objectives:

Workstream 1

i. To conduct a systematic review to improve understanding of interventions (including socio-economic, health, property, nature-based and community) that can reduce short and long-term mental health and wellbeing effects of all types of flooding; and

ii. To consider to what extent these interventions are applicable, relevant and effective in the Scottish context for different individuals or groups, particularly those at risk of poorer mental health outcomes from flooding.

Workstream 2

iii. To conduct a policy review to determine what cross-policy actions are being implemented in countries with similar geographic and socio-economic characteristics to Scotland to mitigate the negative impacts of flooding on mental health and wellbeing; and

iv. To conduct policy mapping using a systems-thinking approach to examine how different policy areas in Scotland connect and work together to address impacts of flooding on mental health and wellbeing.

The two Workstreams will bring together these insights to identify areas where Scotland is performing well and where there are policy and practice roadblocks, generating evidence for effective cross-policy development to reduce mental health and wellbeing impacts of flooding in Scotland.

1.3 Structure of the report

The report will first outline the methodological details for Workstream 1 and 2 (section 2.0-2.2) and the key assumptions and limitations (section 2.3). This will be followed by a summary of the main findings from Workstream 1 (section 3.1) and then Workstream 2 (section 3.2 and section 3.3). Key recommendations for policy and research emerging from both Workstreams will then be outlined in section 4 and the main conclusions summarised in section 5. References can be found in section 6, followed by the Appendices.

2.0 Methodology

2.1 Workstream 1: Systematic Review of Interventions

A systematic literature review was undertaken in accordance with relevant PRISMA guidance (Tricco *et al*., 2018), and followed a protocol registered with the Open Science Framework (OSF). The steps in the systematic review are summarised in Figure 3, with full methodological details available in Appendix 1.1.

2.2 Workstream 2: Policy Review and Policy Mapping

2.2.1 Policy Review Eligibility Criteria and Search Strategy

The policy review focused on national climate adaptation plans, as these serve as strategic frameworks to integrate climate resilience into national policies, and relevant case studies from 20 countries broadly comparable to Scotland in terms of geography, climate and socio-economic context (small to medium population size, high-income economies, temperate climates, strong public sectors, and a mix of coastal and rural areas). Case studies were identified through targeted online searches of government websites, climate adaptation platforms (e.g. ClimateAdapt, C40), and Google, using a snowballing research approach and combinations of terms related to flooding, mental health and wellbeing, cross-policy actions and interventions, aligned with the Workstream 1 search protocol. Only policies published within the last 25 years were included (from 2000 to 2025). Existing reviews of National Adaptation Plans (NAPs) and Health National Adaptation Plans (HNAPs) informed and guided the overall snowballing methodological approach (Eissa *et al*., 2025; World Health Organization, 2025).

2.2.2 Policy Review Data Synthesis

A narrative synthesis was undertaken, structured around key analytical categories where relevant: types of interventions (e.g. socio-economic, health, property-based, nature-based, community or psychological); flood pathway (flood adaptation and mitigation, preparedness, response, recovery); governance infrastructure (roles and responsibilities across sectors and levels of government); intended target populations (general population and priority or vulnerable groups); and any identified incentives, support mechanisms, barriers or implementation challenges (summarised in Figure 4).

Figure 3: Steps in the systematic review process.

Figure 4: Policy review data synthesis process.

2.2.3 Policy Mapping Approach

Scottish policies and policy-related documents were identified, analysed and mapped to address the question: how could different policy areas in Scotland connect and work together to address impacts of flooding on mental health and wellbeing? The most prominent policy areas for flooding and mental health are climate and health. The policy map does not include all the documents analysed, only reports that mentioned mental health **AND** flooding in the same section. For instance, the Scottish Government's Housing to 2040, and Public Health Scotland's "Together we Can" 10-year strategy were analysed, but flooding and mental health are not mentioned together. Strategies included the UK Climate Change Risk Assessment, the National Flood Resilience Strategy, the Scottish National Adaptation Plan 2024-2029, the NHS Scotland Climate Emergency and Sustainability Strategy 2023-2026, the Public Health Scotland Adverse Weather and Health Plan 2024-2027, the Public Health Scotland Plan 2024-2027, Scotland's Population Health Framework 2025-235, and the Mental Health and Wellbeing Strategy. Additional strategies were those from areas including but not limited to Equality & Inclusion (e.g. A Fairer Scotland for Older People: Framework for Action); Housing (e.g. Housing Standards; Rented sector strategy); Children & Young People (e.g. Recommendations made by the Children & Young People's Mental Health and Wellbeing Joint Delivery Board); Health & Social Care; Population Health; and Planning & Infrastructure. The content of relevant strategies and policies was analysed thematically and the interconnections between them were highlighted. Section 3.3 details the approach and the full list of strategies analysed is included in Appendix 2.2.

2.3 Assumptions and Limitations

Limitations of the search process for Workstream 1 include the inclusion of only studies published from 2010 onwards, potentially excluding relevant older literature. Searches were limited to English language articles, potentially excluding relevant non-English language studies. Search terms may not have picked up all potentially relevant articles, particularly given the broad range of interventions considered in the review and the difficulty of covering all relevant search terms. The limited grey literature search may also not have located all relevant studies which were not published in an academic journal. An adapted version of the Mixed Methods Appraisal Tool was used which limited the depth of quality appraisal and time constraints also limited the depth of narrative synthesis for both Workstreams.

Similarly, limitations of the search process for Workstream 2 included the exclusion of non-English language policies. OpenGrey was not used due to its discontinuation in 2020 and PolicyCommons searches proved unproductive so were not taken forward. Limitations of the policy mapping component included that only policies mentioning 'mental health' and 'flooding' were included in the map, potentially excluding those that considered wellbeing, or mental health within 'health'. Given time and resource constraints, the research team could not search, analyse and include all potentially relevant strategy and policy documents related to mental health and flooding.

3.0 Findings

3.1 Workstream 1: Systematic Review of Interventions

3.1.1 Search Results

Figure 5 displays the results of the literature searches. A final total of 28 articles met the eligibility criteria and were included in the review after the screening process. The included studies were geographically concentrated in the UK (England and Wales) and Western Europe (Table 1 and Appendix 1.2). Fifteen studies were conducted in England or Wales, four in Germany, two in France, two in Poland, and one each in Australia (Tasmania), Japan, New Zealand, and Canada (Figure 5). None were conducted in Scotland. Study designs were predominantly observational: ten cross-sectional, eight qualitative studies, five mixed-methods investigations, three longitudinal observational studies, one quasi-experimental study, and one randomised controlled trial (RCT). Sample sizes ranged from 9 participants in a qualitative longitudinal study (Butler *et al*., 2018), to over 5,000 households in a longitudinal survey (Osberghaus *et al*., 2025). The sole RCT enrolled 146 participants (Müller *et al*., 2024). Most studies had low-moderate methodological quality and were constrained by their cross-sectional designs, small samples, and limited confounding control (see quality assessment ratings according to the adapted Mixed Methods Appraisal Tool in Appendix 1.3). Given the potential for selection bias and the non-representativeness of most studies examined, the external validity of the evidence reviewed is limited.

Across the included studies, samples were largely drawn from flood-affected general populations, most commonly adult residents living in areas that had recently experienced flooding. Many studies focused on households or communities directly exposed to flooding, while fewer explicitly included comparison groups from non-flooded areas. Samples typically included a mix of genders and age groups, with some studies focusing on older adults (Walkling and Haworth, 2020), or adolescents specifically (Bokszczanin, 2012). Socio-economic characteristics such as income, housing tenure, or employment were inconsistently reported, and ethnicity was rarely examined in detail. Vulnerable groups, such as individuals with pre-existing mental health conditions, low-income households, or those experiencing repeated flooding, were not frequently identified, consistently oversampled or analysed separately, limiting synthesis for vulnerable groups.

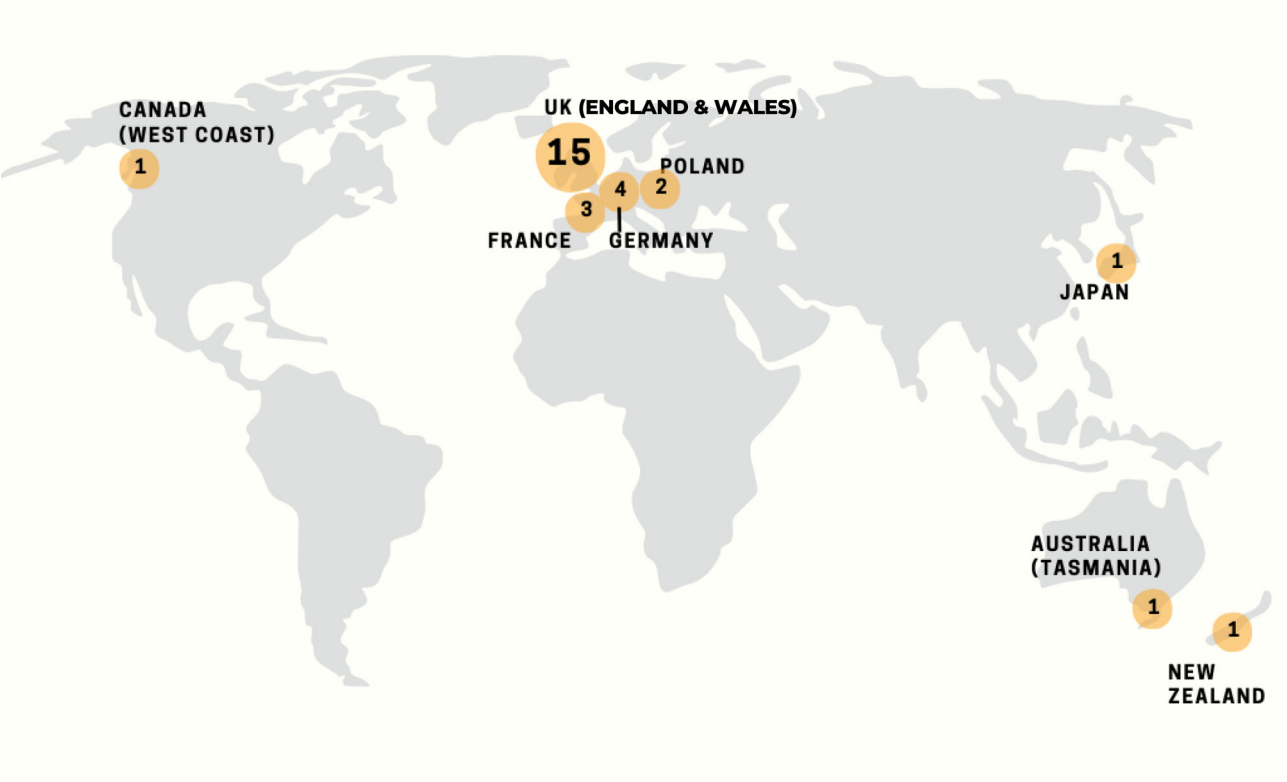

Figure 5: Included studies by country.

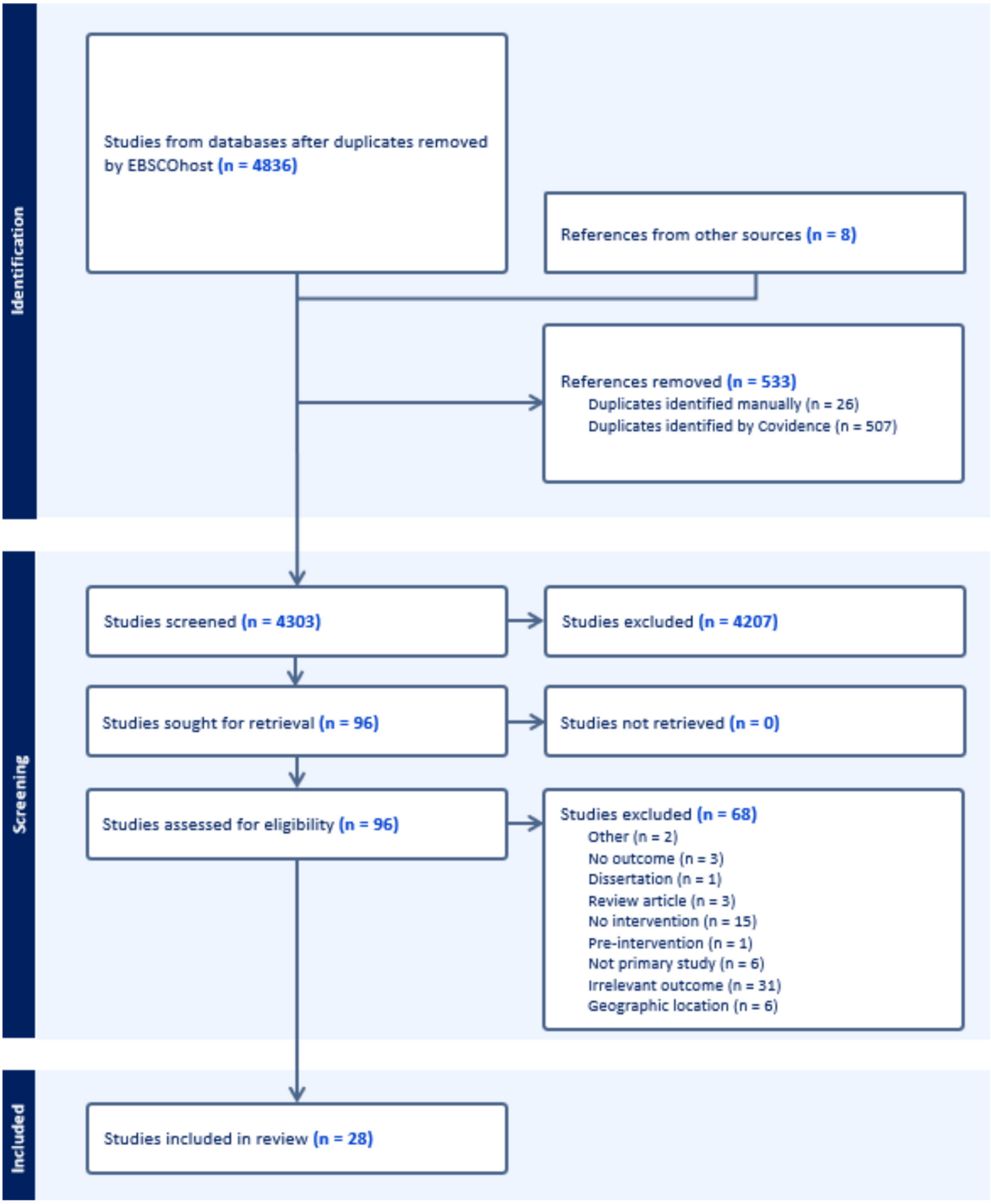

Figure 6: PRISMA flowchart showing the systematic review search and screening results.

The distribution of evidence across the flood pathway is uneven. The recovery phase had the largest evidence base, addressed by at least 17 of the 28 studies. Adaptation and preparedness were addressed by approximately 12 studies. Evidence here was predominantly observational or qualitative. The strongest finding was the protective effect of early warning systems (>12 hours), which significantly reduced depression and post-traumatic stress disorder (PTSD) scores among displaced persons (Munro *et al*., 2017). Property-level preparedness was associated with improved subjective well-being (Hudson *et al*., 2019) and reduced long-term mental health deterioration (Lamond *et al*., 2015), but these associations were derived from cross-sectional designs that cannot establish causality. The acute response phase had the least direct evidence, with only a few studies examining this period (Carroll *et al*., 2010; Dootson *et al*., 2023; McLachlan and Waitoki, 2022).

The most commonly assessed outcomes across quantitative studies were depression, anxiety, PTSD, and psychological distress. Some studies used validated instruments including the General Health Questionnaire (GHQ), Generalised Anxiety Disorder (GAD), Patient Health Questionnaire (PHQ) scales, amongst others. Subjective wellbeing was measured on a 0–10 scale in one study (Hudson *et al*., 2019). Several qualitative studies documented anxiety, stress, depression, and PTSD symptoms through interviews (Butler *et al*., 2018; Carroll *et al*., 2010; Lorenzoni *et al*., 2024; Mehring *et al*., 2023).

Overall, the literature was characterised by studies with different designs, with a stronger emphasis on descriptive and exploratory studies than on robust causal evaluation of intervention effectiveness, or process evaluation. The strongest quantitative evidence for an intervention effect came from the single RCT by Müller *et al*. (2024), which demonstrated that a 6-week digital mindfulness intervention delivered approximately 6-months after a flood disaster in Germany produced significant improvements across all measured mental health variables in flood-affected individuals and volunteers, with no deterioration at follow-up (Müller *et al*., 2024). However, this study had a predominantly female sample (80.1%). The quasi-experimental study by Sugiyama *et al*. (2020) found that a single 50-minute group CBT session delivered to senior school pupils around seven months after a heavy rain disaster in Japan reduced depression scores in the high-depression group with a moderate effect size (Cohen's d = 0.46) (Sugiyama *et al*., 2020), but the clinical relevance of this finding is uncertain.

Table 1: Details of the 28 included studies in Workstream 1 systematic review (ordered by Flood Pathway Stage).							
Study	**Study Design**	**Country**	**Sample Size**	**Flood Pathway Stage**	**Research Focus**	**Key Finding**	**Identified Limitation**
Andrews *et al.* (2022)	Mixed methods	UK	114	Adaptation/ preparedness	Driving factors for urban wetland design, function, and use in the UK	Climate resiliency perceived as important function of wetlands; willingness to visit wetlands for nature and quality of life noted	Opportunity and snowball sampling limit representativeness
Bazart *et al.* (2020)	Cross-sectional survey	France	782	Adaptation/ preparedness	Acceptability of coastal relocation among French residents, role of communication and governance	Humour-based communication stimulated stronger emotional response and interest; governance quality was decisive for relocation acceptability	Does not directly measure mental health outcomes; challenges operationalising communication effects; French coastal context
Harries *et al.* (2012)	Secondary analysis of survey data	UK (England)	555 households	Adaptation/ preparedness	Anticipated emotional consequences of household flood protection uptake in England	Protective behaviour influenced more by emotional concerns (anxiety, insecurity) than material cost-benefit calculations	Secondary analysis of data collected for different purpose; low representativeness
Schernewski *et al.* (2018)	Mixed methods	Germany	820 survey respondents	Adaptation/ preparedness	Public participation and information in coastal protection and wetland restoration in Germany	89% felt insufficiently informed; media dominated perceptions; insufficient information was the major reason for poor acceptance	Focused on coastal protection acceptance, not mental health; limited generalisability from single case study; no mental health outcomes
Sundareswaran *et al.* (2015)	Qualitative	Canada	21	Adaptation/ preparedness	Disaster resilience and preparedness for homeless populations in Canada	Need for upstream continuity planning and collaboration between emergency management and community organisations	Small qualitative sample (n=21); Canadian context; no flood-specific intervention tested
Walkling *et al.* (2020)	Qualitative	UK (Wales)	12	Adaptation/ preparedness	Flood risk perceptions and coping among retired populations in north Wales	Retired populations are diverse in perceptions and capacities; social coping capacities can be sustained despite physical limitations; preference for interpersonal communication	Very small sample (n=12); church membership bias; single coastal town; no mental health outcome measurement
Dootson *et al.* (2023)	Cross-sectional survey	Australia	1,563	Adaptation/ preparedness and acute response	Efficacy of emergency communication videos for floods and bushfires in Australia	Videos showing real-life impact improved hazard knowledge, risk perceptions, and protective action intentions	Australian context limits transferability; measured intentions not behaviour
Paranjothy *et al.* (2011)	Cross-sectional survey	UK	~3,600 respondents	Adaptation/ preparedness and acute response	Psychosocial impact of 2007 UK floods and risk factors for mental health symptoms	Two- to five-fold higher prevalence of distress, anxiety, depression, and PTSD among those with floodwater in the home; financial concerns and service disruption increased risk	Low response rates (14–38%); demographic skew toward older women; cross-sectional design precludes causal inference; no pre-flood mental health data
Garde-Hansen *et al.* (2017)	Qualitative	UK (England)	65	Adaptation/ preparedness and recovery	Sustainable flood memory as resilience following the 2007 UK floods	Community and communicative memory of past floods fostered resilience; strategic forgetting also observed as coping	Small sample; difficulty engaging younger participants; limited to specific UK floodplain settings
Hudson *et al.* (2017)	Cross-sectional survey	France	~900 households	Adaptation/ preparedness and recovery	Monetisation of flood impacts on subjective well-being and effect of household preparedness measures in France	Home elevation associated with SWB gain worth approximately €39,000; intangible losses approximately twice tangible losses	Recall bias; limited to French flood-prone households

Study	Study Design	Country	Sample Size	Flood Pathway Stage	Research Focus	Key Finding	Identified Limitation
Lorenzoni *et al.* (2024)	Mixed methods	UK	350 questionnaires	Adaptation/ preparedness and recovery	Governance and expectations of UK's first sandscaping coastal management scheme in Norfolk	Residents reported reduced anxiety and improved sleep following scheme implementation; stakeholder collaboration was critical	Small household survey sample; no standardised mental health measures; findings not generalisable beyond study site; pre-implementation timing
Mehring *et al.* (2023)	Qualitative	England	20	Adaptation/ preparedness and recovery	Experiential construction of flooding focusing on emotional and long-term impacts in England	Flooding removes home security, creating fear, stress, and anxiety; emotional impacts prevail for years; policy critiqued for neglecting emotional dimensions	Small sample (n=20); potential researcher bias; recruitment through specific organisations
Osberghaus *et al.* (2025)	Longitudinal survey	Germany	>5,000 households	Adaptation/ preparedness and recovery	Intention-behaviour gap in climate change adaptation among German households	Substantial gap between stated adaptation intentions and implementations; anticipated regret partly explains the gap	Does not directly measure mental health outcomes; sample biased toward older, better-educated households; binary measures may oversimplify behaviour
McLachlan *et al.* (2022)	Qualitative case study	New Zealand	32	Acute response and recovery	Collective action by Māori communities in response to flooding in New Zealand	Genealogical relationships, collective leadership, and Indigenous values drove effective collective response to flooding	Small sample with snowball sampling; cultural specificity limits transferability
Munro *et al.* (2017)	Cross-sectional survey	England	622	Recovery (with preparedness implications)	Effect of displacement and early warning on mental health outcomes one year after 2013/14 English floods	Displacement significantly associated with depression (OR 1.95), anxiety (OR 1.66), and PTSD (OR 1.70); early warning (>12h) was protective for depression and PTSD	23% response rate; affluent, predominantly white sample; single time point; potential overreporting of symptoms; residual confounding
Bokszczanin *et al.* (2012)	Longitudinal observational	Poland	262 adolescents	Recovery	Adolescent social support provision following flooding in Poland and subsequent wellbeing	Providing social support was associated with higher perceived support, sense of community, and proactive coping up to two years post-flood	Low disaster exposure severity in sample; high attrition; school-based recruitment limits generalisability; no pre-disaster assessment
Butler *et al.* (2018)	Qualitative longitudinal	UK (Somerset)	9	Recovery	Narratives of mental health recovery after 2013/14 Somerset floods, focusing on institutional support	Institutional support shaped mental health recovery trajectories; perceived absence of support worsened outcomes	Very small sample (n=9); self-selected participants; qualitative design limits generalisability
Kaniasty *et al.* (2012)	Longitudinal mixed methods	Poland	285	Recovery	Post-disaster social support mobilisation and deterioration dynamics following 1997 Polish flood	Received social support predicted favourable social psychological wellbeing at 20 months; post-disaster social bitterness predicted lower wellbeing	Retrospective self-reports may introduce bias; specific Polish context; no clinical mental health diagnoses
Klör *et al.* (2025)	Cross-sectional survey	Germany	277	Recovery	Factors influencing mental burden 18 months after the 2021 Ahr Valley flood in Germany	Health status and persistent mental preoccupation were stronger predictors of mental burden than flood characteristics or reconstruction progress	Excluded unaffected households and non-German speakers; self-reported outcome only; single time point with 6.6% response rate
Mulchandani *et al.* (2019)	Secondary analysis of cross-sectional survey	England	851	Recovery	Effect of insurance-related factors on flood-mental health association in England	Lack of insurance increased odds of PTSD (aOR 4.31); severe insurance stress increased odds of depression (aOR 11.08), anxiety (aOR 4.48), PTSD (aOR 7.95)	Potential recall bias; lack of explicit definition of insurance issues; unmeasured confounders; wide confidence intervals for some estimates

Study	Study Design	Country	Sample Size	Flood Pathway Stage	Research Focus	Key Finding	Identified Limitation
Müller *et al.* (2024)	RCT (wait-list controlled)	Germany	146	Recovery	Digital mindfulness intervention for flood victims and volunteers after 2021 German flood	Statistically significant improvements in self-compassion, life satisfaction, positive affect; reductions in negative affect, perceived stress, and pathological symptoms	Predominantly female sample (80%); lack of blinding; wait-list control only; no active comparator; potential social desirability bias; unclear whether mental health issues were flood-related
Lamond *et al.* (2015)	Cross-sectional survey	England	280	Recovery	Factors affecting long-term psychological impact in households flooded in 2007 England	Low income (8x risk), relocation >6 months (6x risk), and absence of mitigation measures associated with severe mental health deterioration	Single flood event; self-selection bias; no pre-flood baseline; household-level self-report
Raguenaud *et al.* (2012)	Observational surveillance	France	227 case files	Recovery	Outreach psychological support programme after Xynthia storm in France	227 first-time users identified with depression, anxiety, and PTSD; predominantly female and older adults; programme enabled monitoring and guidance to authorities	Only initial consultations recorded; no effectiveness comparison; completeness of case reporting unmeasured
Sugiyama *et al.* (2020)	Quasi-experimental	Japan	229	Recovery	School-based CBT intervention for Japanese students affected by Hiroshima heavy rain disaster	Significant reduction in depression scores for high-depression group (d=0.46); resilience increased in both groups	Single 50-minute session; school restrictions limited outcome measurement; Japanese cultural context
Walker-Springett *et al.* (2017)	Mixed methods	UK (England)	n=60 (qualitative), n=1,000 (survey)	Recovery	Pathways to wellbeing outcomes following 2013/14 UK floods in Somerset and Boston	Lack of agency, dislocation from home, and disrupted futures drove negative wellbeing; community networks provided offsetting positive effects	18-month observation window may miss longer-term changes; self-selection in qualitative phase; limited analysis of repeated flooding
Wind *et al.* (2011)	Cross-sectional survey	UK (England)	232	Recovery	Social capital and post-disaster mental health in flood-affected Morpeth, England	Cognitive social capital negatively associated with mental health problems; structural social capital positively associated with anxiety	Cross-sectional design limits causal inference; considerable non-response; single flood-affected town
Carroll *et al.* (2010)	Qualitative	England	46	Multiple stages	Health and social impacts of the 2005 Carlisle floods in England	Psychological stress, anxiety, depression, and PTSD symptoms reported; insurance and construction disputes exacerbated mental health; support workers also suffered stress	Small sample (n=46); interviews 10–13 months post-flood with possible recall issues
Turnpenny *et al.* (2024)	Qualitative policy analysis	England	30 interviews	Multiple stages	Policy capacity for addressing climate change-related mental health risks in England	Analytical and political capacity moderately strong, but operational capacity strained; fragmentation between health and other sectors limits coordinated adaptation	Focus on England; qualitative design with purposive sampling; no direct measurement of intervention effectiveness

3.1.2 Thematic Analysis

Theme 1: The Protective Role of Community Social Capital and Support Networks

A consistent finding across multiple studies is that community-level social resources may help to serve as a buffer against adverse mental health outcomes after flooding. Walker-Springett *et al*. (2017) identified community networks and interactions as potentially producing offsetting positive effects against the negative wellbeing impacts of flooding, including loss of agency and dislocation from home (Walker-Springett *et al*., 2017). Wind *et al*. (2011) found that cognitive social capital including trust, feelings of mutual support and reciprocity, was negatively associated with mental health problems, though structural social capital (participation in community organisations) was positively associated with anxiety, suggesting that not all forms of social capital are equally protective. Kaniasty *et al*. (2012) demonstrated that greater involvement in post-disaster altruistic communities was associated with more favourable appraisals of interpersonal and community relationships 20 months later, while social bitterness and dissatisfaction with aid predicted lower subsequent well-being.

McLachlan *et al*. (2022) documented how shared historical connections and aspirations for cultural regeneration activated Māori communities to engage in collective action during flood events, using tribal infrastructures for shelters and psycho-social coordination. Bokszczanin *et al*. (2012) showed that adolescents who provided tangible, emotional, and informational support to others after flooding in Piechowice, Poland subsequently reported higher perceived social support, stronger sense of community, and greater proactive coping, characterised by self-determined goal setting and readiness for future challenges, almost two years later. Older adolescents also showed higher levels of proactive coping (Bokszczanin, 2012).

However, the qualitative evidence also revealed that community support can be fragile. Kaniasty *et al*. (2012) documented that initial post-disaster social support gave way to community animosities and dissatisfaction with aid distribution over time. The deterioration of community post-disaster was found to be a complex process driven by the mismatch between aid supply and demand, inequitable distribution practices, and the emergence of social bitterness stemming from dissatisfaction with help and increased interpersonal conflicts and disaffection. These factors collectively eroded the initial solidarity and benevolence, hindering long-term recovery and well-being (Kaniasty, 2012). Butler *et al*. (2018) identified a "recovery gap" where support from public authorities diminished before individuals had recovered, and the perceived absence of institutional support in specific circumstances affected the mental health burden. While initial community spirit often surged during and immediately after floods, this engagement tended to wane over time. Furthermore, differences in flood impact and recovery experiences led to significant community tensions and divisions, highlighting the inherent limitations and inconsistencies of community support as a standalone solution for long-term mental health recovery (Butler *et al*., 2018).

Theme 2: The Centrality of Home, Displacement, and the Recovery Process

Multiple studies highlighted that the disruption of home, both physically and symbolically, may be a primary driver of adverse mental health outcomes. Mehring *et al*. (2023) described how flooding removes the security and safety of home, creating instead places of fear, stress, and anxiety, with emotional impacts that can persist for a lifetime. The cyclical process of "home unmaking and remaking" was identified as particularly damaging to quality of life.

Quantitative evidence supported this theme. Munro *et al*. (2017) found that displacement was associated with significantly higher odds of depression (OR 1.95, 95% CI 1.30–2.93), anxiety (OR 1.66, 95% CI 1.12–2.46), and PTSD (OR 1.70, 95% CI 1.17–2.48) one year after flooding. However, receiving a flood warning more than 12 hours in advance was protective against depression and PTSD (Munro *et al*., 2017). Lamond *et al*. (2015) identified relocation during reinstatement, particularly for periods exceeding six months, as one of the most predictive factors for long-term mental health deterioration.

The insurance process emerged as a critical secondary stressor. Mulchandani *et al*. (2019) found that lack of household insurance was associated with a fourfold increase in PTSD odds (aOR 4.31, 95% CI 1.31–14.20), and severe stress from insurance issues was associated with elevated odds of depression (aOR 11.08, 95% CI 1.11–110.30) and PTSD (aOR 7.95, 95% CI 2.10–30.1). The wide confidence intervals for these insurance-related estimates reflect limited statistical power and the estimates should therefore be interpreted cautiously. Carroll *et al*. (2010) reported that respondents identified disputes with insurance and construction companies as a major source of

psychological harm. Harries *et al*. (2012) found that flood experience reduced confidence in the ameliorative capacity of insurance and promoted the belief that protective measures increase anxiety about flooding.

These papers recommend that the insurance sector must improve transparency by clearly explaining policy coverage and entitlements, as many customers feel misled and uncertain about their rights. They also recommend integrating water safety and pollution guidance into emergency planning, while addressing customer service issues, regulating contractors involved in flood repairs, and creating an independent body for dispute resolution (Harries, 2012). Collaboration with government initiatives, such as grants for high-risk properties, is highlighted as a way to strengthen flood resilience. Additionally, simplifying claims processes and providing targeted support, especially for vulnerable or uninsured individuals (who are more likely to have lower education levels and pre-existing health conditions (Mulchandani *et al*., 2019)), may help reduce the psychological impact of flooding.

Theme 3: Property-Level Preparedness as an Action to Support Mental Health and Wellbeing

Evidence from several studies suggests that physical preparedness measures serve not only to reduce tangible flood damage, but can also provide psychological benefits. Hudson *et al*. (2019) found that floodplain inhabitants who elevated their homes reported higher subjective well-being, with the monetised benefit estimated at approximately €39,000. The study estimated that intangible wellbeing effects of flooding are approximately twice as large as tangible direct monetary losses, suggesting that flood protection investments are systematically underfunded when intangible benefits are excluded (Hudson *et al*., 2019).

Lamond *et al*. (2015) found that installing flood mitigation measures (e.g. installing door and window guards) was associated with reduced likelihood of severe mental health deterioration following a flood by approximately four-fifths. However, this study was conducted five years after the flood event and likely impacted by recall bias. Harries *et al*. (2012) provided a more nuanced picture, reporting that concerns about emotional consequences, particularly anxiety about whether measures would work, could act as barriers to adoption. Osberghaus *et al*. (2025) identified a substantial intention-behaviour gap in climate change adaptation, finding that stated intentions to install flood-proofing measures were poor predictors of actual implementation, partly explained by anticipated regret of investing in measures that might not be needed.

Theme 4: Institutional and Policy Responses

Butler *et al*. (2018) provided detailed qualitative evidence that institutional actions and perceived absence of support profoundly shaped post-flood mental health recovery trajectories. The study identified that both the nature of institutional support and the manner in which it was delivered affected whether individuals maintained psychological resilience or experienced deterioration.

At the policy level, Turnpenny and Alexander (2024) analysed England's capacity to address climate-related mental health risks and found that while analytical capacity (research, knowledge generation, education) and political capacity (advocacy, policy champions) were relatively strong, operational capacity was significantly strained, restricting coordinated preventive adaptation. This was attributed to resource constraints and fragmentation within and between the health sector and other relevant policy areas. Raguenaud *et al*. (2012) demonstrated that integrating epidemiological surveillance with outreach psychological support enabled monitoring of psychological distress, guided mental health service deployment, and provided timely information to decision-makers.

Theme 5: Communication, Risk Perception, and Emotional Engagement

Several studies addressed how communication strategies influenced flood-related mental health outcomes and preparedness behaviours. Dootson *et al*. (2023) found that videos featuring personal experiences were most effective at improving hazard knowledge, risk perceptions, and protective action intentions. Bazart *et al*. (2020) found that humour-based communication had the comparative advantage of inducing stronger emotional responses in terms of stimulating interest and thought compared to fear-based messaging which could trigger psychological defences like resistance and denial. Schernewski *et al*. (2018) documented that 89% of the local population in a coastal protection area felt insufficiently informed despite information being available, and that media quality (particularly the shift from traditional newspapers to free advertisers) influenced public

acceptance. Walkling and Haworth (2020) found that retired populations preferred interpersonal risk communication methods, such as telephone calls or home visits over digital or broadcast methods.

3.1.3 Synthesis of Evidence

The evidence consistently indicated that flooding is related to substantial and often persistent mental health impacts, including elevated rates of PTSD, depression, anxiety, and psychological distress that can persist for years (Klör *et al*., 2025; Lamond *et al*., 2015; Mulchandani *et al*., 2019; Munro *et al*., 2017; Paranjothy *et al*., 2011). A range of interventions across the socio-economic, health, property, community, and nature-based domains show promise for mitigating these impacts, but the strength of evidence varies considerably.

The digital mindfulness randomised controlled trial (RCT), a study where flood-affected participants were randomly assigned to groups to test cause and effect (Müller *et al*., 2024) and the quasi-experimental CBT study, a design that tested an intervention without full randomisation (Sugiyama *et al*., 2020) provided some of the strongest evidence because they have higher internal validity, meaning they are better at showing whether an intervention directly causes an outcome. However, both have key limitations: the mindfulness study relied on mostly female, self-selected participants already open to meditation (Müller *et al*., 2024) and the CBT study only used a single session (Sugiyama *et al*., 2020). In contrast, large observational studies where researchers observe outcomes without intervening offer greater external validity, meaning their findings are more generalisable to real-world settings. However, these studies have weaker causal inference, so they are less able to prove that the intervention itself caused the outcomes.

Different types of interventions appear to operate through different mechanisms and at different timescales. Property-level flood resilience measures likely work through both a direct pathway (reducing flood damage severity) and a psychological pathway (restoring a sense of control and security) (Hudson *et al*., 2019; Lamond *et al*., 2015). However, Harries *et al*. (2012) showed that the adoption of such measures can itself be inhibited by anticipated anxiety, suggesting that emotional barriers must be addressed in implementation. Community-based interventions appear to operate through fostering cognitive social capital, including trust, mutual support, and reciprocity, rather than participation in community organisations (i.e. structural social capital) alone (Wind *et al*., 2011). This distinction is important because structural social capital was in some cases associated with increased anxiety (Wind *et al*., 2011), possibly because participation in community organisations increases exposure to others' distress.

The divergence between studies finding strong benefits of community (McLachlan and Waitoki, 2022; Walker-Springett *et al*., 2017) and those documenting deterioration of social support over time (Kaniasty, 2012), can be partly explained by timing. When people quickly organise to help each other after a disaster strikes, it may lead to better recovery, but if not sustained, social bitterness and perceptions of unfair aid distribution may emerge as risk factors for poor wellbeing (Kaniasty, 2012). This suggests that interventions to sustain community cohesion through the extended recovery period, not just the immediate aftermath, may be important.

3.1.4 Applicability, Relevance and Effectiveness of interventions in the Scottish context

Regarding Scottish applicability, it is notable that none of the studies were conducted in Scotland, though 15 were based in England or Wales, sharing broadly similar healthcare and public systems, policy frameworks, and climatic conditions. Several contextual factors merit consideration. Scotland's rural communities, coastal geography, and relatively high prevalence of social deprivation in some flood-prone areas may mean that findings from studies of affluent English populations (e.g., in one study where 76% of respondents came from the least deprived quintiles (Munro *et al*., 2017)) underestimate the mental health impacts of flooding in Scottish settings. The insurance-related findings (Mulchandani *et al*., 2019) are likely transferable, though Scotland's distinct legal and housing tenure systems may modify their application. Community-based interventions may have particular relevance given Scotland's policy emphasis on community empowerment and resilience, though the Indigenous community model from New Zealand (McLachlan and Waitoki, 2022) would require substantial cultural adaptation. The digital mindfulness intervention has perhaps the strongest transferability case (Müller *et al*., 2024), given its delivery via digital means, though uptake may vary by population characteristics.

In summary, the flood recovery phase has the strongest evidence base, with interventions spanning health-focused (mindfulness, CBT, outreach counselling), socio-economic (rebuilding

assistance, compensation schemes), and community-based (social capital, institutional support) approaches all showing beneficial associations. The adaptation/preparedness phase has moderate evidence, particularly for early warning systems and property-level measures. Health-focused and community-based interventions have the most diverse evidence across multiple study designs, though no single intervention type has been validated through multiple high-quality evaluations. The evidence base would benefit from quasi-experimental evaluations of community-level and socio-economic interventions, and from studies conducted specifically in Scottish settings to address questions of transferability.

Strength of evidence and limitations

The most consequential gap is the lack of evidence testing interventions specifically designed to reduce flood-related mental health impacts, or which included detailed process evaluation of interventions. Only one RCT was identified, a digital mindfulness programme delivered to flood-affected individuals in Germany (Müller *et al*., 2024), and one quasi-experimental study evaluated a school-based CBT programme in Japan (Sugiyama *et al*., 2020). Neither included an active comparator, and both had significant limitations. All other studies were observational, qualitative, or cross-sectional, meaning that the associations reported between interventions (e.g. property-level measures (Hudson *et al*., 2019), early warning systems (Munro *et al*., 2017), insurance availability (Mulchandani *et al*., 2019)) and mental health outcomes cannot be attributed with confidence to those interventions. This design limitation is particularly important for policy decisions in Scotland, where the question is not merely whether factors are associated with outcomes, but whether specific investments will produce measurable mental health benefits.

Geographic and population coverage presents substantial gaps. No study was conducted in Scotland, and only a small number were situated in contexts with geographic or demographic similarities — such as rural northern England (Carroll *et al*., 2010; Wind *et al*., 2011) or coastal Wales (Walkling and Haworth, 2020). The overwhelming concentration of evidence in England, France, and Germany means that the specific features of the Scottish context, including upland river flooding, remote and rural communities, distinctive healthcare governance through NHS Scotland, and Scotland's particular patterns of socioeconomic deprivation, are unrepresented. Several studies acknowledged limited representativeness due to affluent samples (Munro *et al*., 2017; Paranjothy *et al*., 2011), which compounds this gap given Scotland's patterning of flood risk in areas with higher deprivation. Children and adolescents were examined in only two studies (Bokszczanin, 2012; Sugiyama *et al*., 2020), while older adults featured in qualitative work (Butler *et al*., 2018; Walkling and Haworth, 2020). No study examined individuals with pre-existing severe mental illness as a distinct subgroup, despite this population having little advocacy capacity and being at disproportionate risk (Turnpenny and Alexander, 2024). The absence of subgroup analyses for people with disabilities, those experiencing homelessness, traveller communities, or those in social housing limits the applicability of current evidence to populations that Scottish policy may need to prioritise.

Critical outcome domains remain inadequately assessed. Long-term mental health trajectories beyond two years post-flood are addressed by very few studies (Lamond *et al*., 2015), and no study includes prospective follow-up from before a flood event through to long-term recovery, precluding understanding of how pre-existing vulnerabilities interact with flood exposure over time. The recovery phase of the flood pathway has received the most research attention, but adaptation and preparedness interventions are assessed almost entirely through self-reported intentions or cross-sectional associations rather than through prospective evaluation of mental health outcomes. No direct comparisons of different intervention types were identified, for example, whether community-based psychosocial support is more effective than property-level measures or insurance-related support in reducing the mental health impacts of flooding. Further, no study compared optimal duration, timing or intensity of psychological interventions. The role of nature-based solutions is addressed in studies focused on coastal protection (Lorenzoni *et al*., 2024) and wetland amenity (Andrews and Russo, 2022), but neither provides quantitative mental health outcome data, leaving the mental health co-benefits of green infrastructure investments unevidenced.

Given the reviewed studies' quality and limitations concerning their methodologies, the evidence base provides low-moderate confidence that the interventions included are relevant and potentially beneficial in the Scottish context. Confidence in their effectiveness is constrained by heavy reliance on observational and cross-sectional designs; limited causal evaluation; inconsistent measurement of

mental health and wellbeing outcomes and under-representation of vulnerable subgroups. As a result, while the direction of effects is generally positive, effect sizes, durability, and differential impacts across groups remain uncertain. There is a clear need for Scottish-specific evaluation, particularly of adaptation, preparedness, and equity-focused interventions.

3.2 Workstream 2: Policy Review

Evidence indicates that mitigating the adverse mental health consequences of flooding requires coordinated, cross-policy action across flood risk management, public health, housing, education and community policy (Centre for Climate and Health Security, 2025), with an emphasis on adaptation, equity and long-term recovery rather than short-term responses alone. The majority of reported studies in Workstream 1 and wider academic literature, however, focus on interventions implemented during the recovery phase of flooding, with most evidence examining support provided after flood events had occurred.

Global reviews show that mental health remains largely marginalised within national climate adaptation policy (Eissa *et al*., 2025). While 42% of countries mention mental health in adaptation plans, only 17% of countries include concrete actions. Most countries (58%) have no inclusion of mental health in National Adaptation Plans (NAPs), with just 6% demonstrating strong, actionable integration (including Australia, Ireland, Finland and Austria) and 10% demonstrating moderate inclusion (including Canada, Norway, Netherlands, New Zealand and Japan). A 2025 WHO review reinforces this gap, finding that only 5% of national adaptation plans and 22% of health adaptation plans (often focused subsets of NAPs addressing specific climate-related health risks) contain specific mental health actions, making mental wellbeing one of the least operationalised health outcomes in climate adaptation worldwide (World Health Organization, 2025).

The following broad categories of cross-policy actions/intervention types were identified. Each category will be outlined, and case studies presented below and summarised in tables.

1. **Governance & System-Level Interventions** (4 case studies)
2. **Planning & Prevention Interventions** (2 case studies)
3. **Structural & Environmental Interventions** (7 case studies)
4. **Ensuring Continuity of Health and Social Care Infrastructure** (1 case study)
5. **Preparedness & Risk Communication Interventions** (7 case studies)
6. **Community Participation & Empowerment Interventions** (3 case studies)
7. **Equity-Focused Interventions** (5 case studies)
8. **Health & Psychosocial Support Interventions** (9 case studies)
9. **Housing & Financial Security Interventions** (4 case studies)

3.2.1 Governance & System-Level Interventions

This group of interventions involve structures that ensure collaboration across policy silos. Typical examples include joint flood–health governance groups; shared outcomes and indicators; and cross-budget funding mechanisms. The negative impacts of flooding on mental health and wellbeing may be reduced through more consistent support before, during and after flood events across sectors; better adaptation and reduced service gaps. Typical policies linked include public administration, performance frameworks and finance.

Fragmentation across policy silos undermines flood recovery and mental health outcomes. National frameworks from Australia, Ireland, Denmark and Finland demonstrate that whole-of-government approaches, shared outcomes and cross-sector coordination enable consistent, adaptive action (Table 2). Integrating health into flood planning, adaptation law and public administration helps to ensure mental wellbeing is addressed upstream, rather than as an afterthought. These interventions operate through system coherence and adaptation pathways.

Table 2: Case Studies - Governance & System-Level 1A – 1D (see Appendices for detail).			
Case Study	**Region**	**Intervention**	**Reference**
1A. National Disaster Mental health & Wellbeing Framework	Australia	National policy and system coordination framework for disaster mental health	Australian Government, 2023; Australian Government Department of Health and Aged Care, 2023
1B. Health in all Policies and Flood Adaptation	Ireland	Cross-government policy integration framework (Health in all Policies, HiAP)	Healthy Ireland and Department of Health, 2019; Healthy Ireland, 2021; Pyper *et al.*, 2021
1C. Flood Risk Management	Finland	Integrated, anticipatory flood risk governance centred on adaptation, early warning, and coordinated land-use planning	Ministry of Agriculture and Forestry, 2014
1D. Multi-functional green/ blue infrastructure	Denmark	Community co-designed, multifunctional green/blue flood infrastructure as a wellbeing-led urban adaptation strategy	Baykal, 2012

Policy relevance for Scotland: Whole-of-government approaches that integrate adaptation, preparedness, response and recovery are critical. Case studies demonstrate the value of Health in All Policies applied to flood and climate adaptation, national coordination across sectors, and health-led evaluation of interventions which are not seen as traditional health interventions. Scotland's existing cross-government climate adaptation and public health architecture, including a Health in all Policies (HiAP) approach as adopted by PHS Climate Change & Sustainability Strategic Approach 2023-2026 and noted in the Scottish National Adaptation Plan (SNAP3), provides a strong foundation for more explicit system-wide alignment on flood-related mental health impacts. A HiAP approach aims to ensure that climate related policies are designed to minimise the health and equity risks posed by a changing climate, including scaling up capacity of partners at a local level to use public health principles, tools and approaches such as Health Impact Assessments and the Place Standard Tool with a climate lens.

3.2.2 Planning & Prevention Interventions

These interventions embed mental health into flood planning and decision-making, not just response. Examples include mental health considerations in flood risk assessments; Health Impact Assessments for flood schemes; and wellbeing-weighted appraisal of flood investments. The various pathways through which negative mental health and wellbeing impacts from flooding may be mitigated include via reduced chronic flood anxiety; reduced cumulative stress from repeated exposure; and early identification of vulnerable groups as part of the planning process. Typical policies linked include flood management policy, public health, equality and human rights, and climate adaptation.

The Netherlands and Norway illustrate how embedding mental wellbeing into flood risk management through statutory, place-based systems may reduce both the physical and psychological harms of flooding (Table 3). In the Netherlands, integrated programmes such as *Room for the River* align flood management, spatial planning and public health through community co-designed green–blue infrastructure that helps to reduce flood risk while enhancing everyday wellbeing, agency and sense of place, with psychosocial support coordinated alongside physical recovery. Norway complements this approach through national planning law that requires municipalities to jointly assess climate and health impacts, embedding mental wellbeing into flood preparedness and adaptation, and coordinating emergency response, primary care and social services to protect social networks and reduce flood-related stress, anxiety and displacement trauma, particularly in rural and coastal communities.

Policy relevance for Scotland: Embedding mental health and wellbeing into flood risk management, land-use planning and climate adaptation could reduce both physical and psychological harm. Prevention could be most effective when mental health considerations are normalised within statutory plans rather than treated as exceptional responses, hence mental health and wellbeing signposting and outcomes could be systematically incorporated into Local Flood Risk Management Plans and spatial planning processes. Under the Planning (Scotland) Act 2019 planning is expected to improve the health and wellbeing of people. Local Development Plans (LDPs) set the overarching strategy to guide development in a local area.

Table 3: Case Studies – Planning & Prevention 2A – 2B (see Appendices for detail).			
Case Study	**Region**	**Intervention**	**Reference**
2A. Place-based flood adaptation: Room for the River	Netherlands	Integrated, place-based flood adaptation through multifunctional green–blue infrastructure with community co-design	Ministry of Infrastructure and Water Management, 2023; Ministry of Agriculture, Nature and Food Quality, and the Ministry of the Interior and Kingdom Relation, 2024
2B. National planning law jointly assesses health and climate impacts	Norway	Statutory, local-government–led integration of public health (including mental wellbeing) into climate and flood risk planning and preparedness	Norwegian Ministry of Climate and Environment, 2025

Incorporating mental health and wellbeing goals into the LDP's "Spatial Strategy," could ensure that new developments prioritise access to nature, active travel, and social spaces that promote mental health. Action programmes accompany the LDP and can be used to set specific targets, such as signposting local mental health support services, community hubs, or green spaces. Place and Wellbeing Assessments alongside Health Impact Assessments (see section 3.2.1) can be used early in the planning process to identify how a proposed development can, for example, better connect residents to existing, non-clinical mental health support, third-sector services, or digital resources.

3.2.3 Structural & Environmental Interventions

In the context of this work, a structural intervention refers to a change to the physical infrastructure or built environment designed to reduce flood risk. These involve flood risk measures designed to deliver psychological as well as physical protection. Examples include multi-functional flood defences (e.g. parks, paths); property flood resilience measures combined with wellbeing advice; and natural flood management that may enhance sense of place. The various pathways that negative mental health and wellbeing impacts from flooding may be reduced include via reduced fear and uncertainty; increased perceived safety and control; and everyday stress reduction via green/blue space. Typical policies linked include flood risk management, planning, green infrastructure and public health.

International examples (Table 4), such as the Netherlands' *Room for the River* and Denmark's floodable parks, show how multifunctional green–blue infrastructure can deliver flood protection while also acting as public space that can reduce anxiety and support psychological wellbeing. UK examples, including the Flood and Coastal Erosion Risk Management (FCERM) Strategy and local natural flood management pilots, suggest that property level resilience, nature-based solutions and resilient infrastructure may reduce chronic stress even in the absence of flood events. However, whilst there is strong evidence from the academic literature that flooding can cause significant mental health issues and nature-based interventions can improve mental wellbeing, there is a lack of direct, long-term evaluation that specifically quantifies any reductions in negative mental health impacts from flooding as a direct result of implementing nature-based flood management. Similarly, research specifically focusing on how structural interventions (like flood walls) reduce these impacts is also limited. These interventions operate primarily through adaptation pathways. Workstream 1 found that there is a limited evidence-base concerning the effectiveness of adaptation-based interventions to reduce adverse mental health impacts despite there being much interest in nature-based solutions, highlighting a need to strengthen evaluation of these interventions, especially in the Scottish context.

Policy relevance for Scotland: Scotland already has strong natural flood management policy frameworks, place-based public health delivery and examples of green prescribing (e.g. Green Health Partnerships, NatureScot) initiatives. Integrating mental health and wellbeing outcomes explicitly into Local Flood Risk Management Plans, Local Development Plans and building standards would mainstream adaptation rather than rely on post-disaster response. Mental health and wellbeing could be treated as a core component of flood resilience, not an add-on. Public Health Scotland is already a member of the flood resilience group, which could help facilitate this priority.

Table 4: Case Studies - Structural & Environmental 3A – 3G (see Appendices for detail).			
Case Study	**Region**	**Intervention**	**Reference**
3A. Copenhagen cloudburst management plan	Denmark	Nature-based flood risk management and urban climate adaptation	Baykal, 2012
3B. West Yorkshire Flood Innovation Programme	UK	Integrated natural flood management and public mental health	van Leeuwen, Zaqout and Armstrong, 2022
3C. Liverpool City Green Infrastructure Strategy	UK	Nature-based solutions and green infrastructure	European Commission and the European Environment Agency (EEA), 2025c
3D. Flood and Coastal Erosion Risk Management (FCERM) Strategy	UK	Preventative and resilience-building, incorporates public health perspectives into flood risk management	Environment Agency, 2022
3E. Room for the River	Netherlands	Integrated adaptive-place-based systems, aligning flood risk management, spatial planning and public health	Rijke et al., 2012; Ministry of Infrastructure and Water Management, the Ministry of Agriculture, Nature and Food Quality, and the Ministry of the Interior and Kingdom Relation, 2024
3F. Climate-resilient construction and planning	Germany	Regulatory and planning-based climate adaptation	European Commission and the European Environment Agency (EEA), 2025a
3G. Pathfinder Project	UK	Population-level risk communication and preparedness: property flood resilience	JBA Consulting, 2026

3.2.4 Ensuring Continuity of Health and Social Care Infrastructure

This group of interventions involves physical measures (flood barriers, pumps, protected layouts) for hospitals, clinics and pharmacies to reduce interruptions to care. The various pathways by which negative mental health and wellbeing impacts from flooding may be reduced include via lowering psychological distress caused by loss of services. Typical policies linked include health, planning and flood risk management.

The Norway case study demonstrates how climate-adapted health infrastructure may function to protect mental health as well as a flood resilience intervention (Table 5). Site-wide flood protection was integrated into hospital redevelopment, safeguarding service continuity, patients and staff during extreme flood events. This case shows that proactive, cross-sector investment in resilient healthcare infrastructure may reduce anxiety, prevent service disruption and strengthen community confidence in emergency care during climate shocks.

Policy relevance for Scotland: Flood-resilient health and social care infrastructure is essential for maintaining wellbeing during and after extreme events. Case studies highlight the importance of integrating flood protection into health capital planning, retrofitting existing assets and recognising health facilities as critical resilience infrastructure. NHS Scotland is working towards this as evidenced in the NHS Scotland Climate Emergency and Sustainability Strategy 2022-2026. More work is needed to ensure resilience for social care infrastructure as this has been limited to date. Adaptation Scotland have recently (March 2026) released guidance for practitioners on building climate resilient social care and represents the first of such developments. Aligning NHS Scotland capital investment, resilience standards and climate adaptation planning could strengthen system continuity and community confidence.

Table 5: Case Studies - Continuity of Health and Social Care Infrastructure 4A (see Appendices for detail).			
Case Study	**Region**	**Intervention**	**Reference**
4A. Forde Central Hospital Flood Protection	Norway	Critical health infrastructure climate-adaptation and resilience	European Commission and the European Environment Agency (EEA), 2025b

3.2.5 Preparedness & Risk Communication Interventions

This group of interventions involves flood preparedness approaches that may help to reduce anticipatory stress. Examples include clear, consistent flood risk communication; public information campaigns on what to do before, during, and after floods, plus clear signposting (helplines, GPs, local hubs); and early warning systems combined with psychosocial guidance. The various pathways that negative mental health and wellbeing impacts from flooding may be mitigated include via reduced panic and uncertainty; increased confidence in response systems; and faster recovery after events. Typical policies linked include emergency planning, public health, communications and resilience.

Evidence suggests there is a link between uncertainty associated with anticipation of a future flood event and anxiety (Fothergill *et al*., 2021), whilst clear information can lead to reduced panic. Anticipatory stress can be a mental health burden, but trustworthy and timely communication can be a key factor in reducing the likelihood of developing psychological distress (e.g. receiving a warning at least 12 hours before a flood (English National Study of Flooding & Health, 2020). From the case studies examined (Table 6), it is suggested that effective communication interventions combine: a single trusted source of information; plain, non-clinical language; early reassurance, not just crisis messaging; explicit sign-posting to mental health and wellbeing support; repeated messaging across multiple channels; and in-person community-level outreach, not just digital platforms for accessing information. Case studies from the UK, New Zealand, Germany, Spain and Canada show that clear, trusted, multichannel communication may help to reduce panic and long-term distress. National flood mapping and risk information programmes may contribute to reducing anxiety by improving planning certainty and preparedness. These interventions primarily operate through anticipatory stress reduction and confidence-building pathways.

Policy relevance for Scotland: Case studies suggest clear, trusted and actionable flood risk communication can reduce psychological stress, as well as physical harm by integrating mental health and wellbeing messaging, service sign-posting and practical guidance into warnings. Mental health messaging could be embedded into SEPA flood warnings, Local Flood Risk Management Plans and NHS24 protocols. Scotland's strong national flood mapping and resilience partnership structures provide a robust platform for coordinated, citizen-focused communication. The recent development of the Scottish household flood plan will use this platform to encourage citizen preparedness, and embeds these principles of clear, trusted communication with easy actions and sign-posting (Henderson *et al*., 2026). Public Health Scotland's Adverse Weather & Health Plan 2024-2027 structured around seven action areas for delivery, covering preparedness, resilience, response, and recovery also provides a framework for integrating risk communication, warnings and mental health and wellbeing messaging.

Table 6: Case Studies - Preparedness & Risk Communication 5A-5G (see Appendices for detail).

Case Study	Region	Intervention	Reference
5A. Environment Agency Floodline	UK	Flood warnings and NHS / Local Authority signposting to mental health support	Environment Agency, 2026
5B. Recovery Connect	Australia	Post-disaster mental health navigation	Balance Internet, 2026
5C. Flood response public messaging	New Zealand	All-of-Government public messaging combining mental wellbeing and safety advice, signposting to mental health support	New Zealand Government, 2024
5D. Ahr Valley & North Rhine-Westphalia	Germany	Flood crisis communication	European Commission and the European Environment Agency (EEA), 2025a
5E. Cumbria flood recovery centres	UK	Flood recovery using multi-agency hubs and sign-posting	Joint Emergency Management and Resilience Team, 2026
5F. LIFE BAETULO	Spain	Integrated multi-hazard early warning and risk communication system	European Commission and the European Environment Agency (EEA), 2022
5G. Flood Hazard Identification and Mapping Program (FHIMP)	Canada	National Flood risk identification and mapping program	Government of Canada, 2023

3.2.6 Community Participation & Empowerment Interventions

These interventions encompass meaningful community involvement that builds agency and trust. Typical examples include co-design of flood schemes and community-led flood resilience groups. The various pathways that negative mental health and wellbeing impacts from flooding may be reduced include via reduced helplessness and trauma; stronger social support networks; and improved collective coping. Typical policies linked include community empowerment, local governance and mental wellbeing.

Social support is a major protective factor after disasters and can act as a buffer against psychological distress (Bryant *et al*., 2017; Kaniasty *et al*., 2020). Sources of support can include family, friends, neighbours, co-workers and the wider community. Supportive and well-resourced communities are ideally placed to assist those in need, disseminate essential information and advocate for external aid following disasters (Hikichi *et al*., 2016). Affected communities need to be provided with resources and support to unite in ways that best fit their existing context, culture and history. Further support should also be provided to those currently isolated to help them engage and broaden their community networks (Black Dog Institute, 2020). Case studies from Australia (Resilient North Coast), the UK (Kirklees WYFLIP), and Northern Ireland (CRUA) suggest that co-design, community leadership and locally embedded resilience hubs may reduce helplessness, strengthen social support networks and improve recovery outcomes (Table 7). The aim of participation is to build trust in institutions, increase uptake of support and transform flood adaptation from a top-down technical process into a shared social project. These interventions operate through empowerment and social cohesion pathways. Case studies highlight the need for long-term, place-based investment, recognising that cumulative flooding requires sustained responses rather than episodic interventions.

Policy relevance for Scotland: Transferable models include community resilience hubs linked to health systems, participatory commissioning, and funding for trusted local organisations. These approaches align closely with Scottish place-based policy and place-based approach to health, Community Planning Partnerships and Health and Social Care Partnerships (HSCP)-led prevention agendas. Linking to locally embedded Climate Hubs could be an opportunity to enhance social support.

3.2.7 Equity-Focused Interventions

This group of interventions involve targeted action for groups that may experience greater adverse mental health impacts. Some examples include additional support in socially disadvantaged or repeatedly flooded areas; tailored interventions for children, older people, and disabled people; and rural and island-specific recovery models. The various pathways that negative mental health and wellbeing impacts from flooding may be reduced include via reduced health inequalities; improved access to support; and greater fairness and trust. Typical policies linked include health inequalities, social justice and rural and island policy.

Floods can widen mental health inequalities, but tailored support could improve outcomes for high-risk groups. Identifying groups at higher psychosocial risk (e.g. children, older people, people with disabilities, renters, low-income households, those with previous mental-health problems) and fast-tracking financial, housing and health support may reduce cumulative stress. People living with disabilities, including psychosocial disabilities are particularly vulnerable during hazardous events due to issues such as mobility or communication. Examples include RAMHP in Australia, the Rural Flood Resilience Partnership in the UK, disability-inclusive disaster governance in New Zealand and Japan, and youth-focused recovery programmes (Table 8). Inclusion, accessibility and coproduction are critical enablers, operating through fairness, trust and access pathways.

Table 7: Case Studies - Community Participation & Empowerment 6A-6C (see Appendices for detail).

Case Study	Region	Intervention	Reference
6A. Resilient North Coast	Australia	Place-based community resilience and mental wellbeing hub	Alliance for Transformative Action on Climate and Health, 2026
6B. West Yorkshire Flood Innovation Programme (WYFLIP)	UK	Integrated flood resilience and community mental health intervention	van Leeuwen et al., 2022
6C. Community Resilience in Urban Areas (CRUA)	Northern Ireland	Community-led flood resilience and psychosocial preparedness	Fermanagh and Omagh District Council, 2016

Table 8: Case Studies - Equity-Focused 7A-7E (see Appendices for detail).			
Case Study	**Region**	**Intervention**	**Reference**
7A. Resilient Kids Program	Australia	Targeted disaster mental health and wellbeing intervention for children and young people	Healthy North Coast, 2024
7B. Rural Adversity and Mental Health Programme (RAMHP)	Australia	Community-embedded mental health resilience and preparedness	RAMHP, 2026
7C. Rural Flood Resilience Partnership (RFRP)	UK	Cross-sector, systems-level resilience partnership integrates flood risk management, agriculture, rural development and wellbeing	Environment Agency, 2024
7D. Emergency Preparation and Support for Disabled People	New Zealand	Governance and participation intervention, Inclusive disaster preparedness and recovery planning, Rights-based, co-production model	Disability Support Services, 2024; National Emergency Management Agency, 2026
7E. Urawaka	Japan	Inclusive disaster preparedness and evacuation planning (community-led, disability-inclusive Disaster Risk Reduction (DRR) with accessible communication and personalised plans)	IASC Reference Group for Mental Health and Psychosocial Support in Emergency Settings, 2021

Policy relevance for Scotland: Targeted, early mental health support can reduce long-term harm for children, young people and other priority groups. School-based, community-embedded and co-designed models could improve access, trust and relevance. Case studies highlight the effectiveness of rural mental health coordinators, psychological preparedness training, and disability-inclusive recovery planning that moves beyond "vulnerability" framing toward participation and co-production. Scotland could build on existing frameworks such as Getting It Right For Every Child (GIRFEC), additional support needs, rural health and disability inclusion by embedding mental health support within flood preparedness and recovery, particularly for children, rural communities, farmers and disabled people.

Other equity-focused needs-based interventions could include enabling access to affordable insurance for socio-economically disadvantaged groups (see section 3.2.9). This fits well with the aims of the Community Wealth Building (2026) Act enacted in March 2026, which intends to provide opportunities to reduce economic and wealth inequalities and increase sustainability and resilience amongst communities. This Act complements and builds on the Community Empowerment (Scotland) Act 2015. Both Acts support inclusion, clear planning, and improved outcomes and benefit from the Scottish Community Development Centre's (SCDC) National Standards for Community Engagement. These standards promote seven principles designed to ensure high-quality, effective, and fair engagement between communities and public bodies to ensure that engagement is a genuine process of involving communities in decision-making to deliver improved, locally driven outcomes.

3.2.8 Health & Psychosocial Support Interventions

This group of interventions involves mental health support embedded within flood response and recovery. Examples include outreach after flood events; trauma-informed primary care and community services; training in PFA for first responders, community leaders and volunteers, and school-based support for affected children. The various pathways that negative mental health and wellbeing impacts from flooding may be reduced include via early intervention preventing escalation; emotional support, practical advice and opportunities to process events potentially leading to reduced risk of PTSD, anxiety, and depression; and normalisation of help-seeking. Typical policies linked include health services, mental health strategies, education and emergency services/ resilience planning.

These approaches tend to be based on strong clinical and public health evidence that early psychosocial intervention reduces risk of PTSD, depression and anxiety (Ministry of Business Innovation and Employment, 2024). Early, proactive outreach may be more effective than opt-in models and embedding support in primary/ community care can improve access. Psychological first aid (PFA) appears promising as part of a

comprehensive, post-emergency intervention strategy. It is a supportive and practical approach to help people in the immediate aftermath of traumatic events or crises. It aims to reduce initial distress and foster healthy coping by ensuring safety, providing comfort, connecting people to support, and promoting hope. It can be delivered by a range of responders (not necessarily health practitioners) and focuses on meeting basic needs, active listening, and empowering individuals to regain a sense of control and connection. Research suggests that a skills-building approach is more effective than supportive counselling (Ministry of Business Innovation and Employment, 2024). Such approaches include a focus on helping those in distress to define their circumstances as external problems, identifying emotions and taking action to tackle challenges, and mindfulness-based stress reduction techniques. Case studies from Italy, Australia, the USA, Germany and Japan show that Psychological First Aid, proactive outreach, school-based screening, and rapid referral pathways may reduce risk of PTSD, anxiety and depression when delivered early (Table 9). Workforce support for emergency responders is also critical to system resilience. Technology-based screening, and rapid referral pathways may reduce risk of PTSD, anxiety and depression when delivered at the appropriate time. Technology enabled mental health services extend reach, particularly in rural and displaced populations. These interventions operate through early intervention and harm reduction pathways.

Policy relevance for Scotland: Case studies support embedded, proactive and outreach-based psychosocial support during and after flood events, with effective models integrating trained mental health professionals into civil contingencies, use of common frameworks (e.g. World Health Organization (WHO)/ Inter-Agency Standing Committee (IASC) Mental Health and Psychosocial Support (MHPSS) framework), support of responders as well as residents, and

Table 9: Case Studies - Health & Psychosocial Support 8A-8I (see Appendices for detail).

Case Study	Region	Intervention	Reference
8A. Emilia-Romagna Floods	Italy	Embedded psychosocial and mental health emergency response	European Commission and the European Environment Agency (EEA), 2024b
8B. Queensland Floods	Australia	Targeted clinical and preventive mental health intervention, school- and community-based “screen-and-treat” model	Cobham and McDermott, 2025
8C. Queensland Floods & Hurricane Sandy	Australia & USA	Proactive population mental health screening with fast-track referral (“screen-and-link”) following flooding and other climate-related disasters	Crompton et al., 2023; Schwartz et al., 2023
8D. Hertfordshire County Council	UK	On-site psychosocial support embedded within emergency flood response, early psychological first response in evacuation settings	Centre for Climate and Health Security, 2025
8E. Intercommunal Trauma Centre, Schleiden	Germany	Integrated psychosocial crisis response and recovery service	European Commission and the European Environment Agency (EEA), 2024a
8F. Technology-enabled mental health services	Australia	Digital mental health delivery and signposting, technology-enabled screening, self-help and referral pathways integrated into disaster response	Black Dog Institute, 2020
8G. The Black Dog Institute	Australia	Integrated, staged mental health system response to disasters, prevention + early identification + treatment + workforce capacity building	Australian Government, 2023; Black Dog Institute, 2020
8H. Community-Based Public Health Nurse (PHN) Model	Japan	Community-based, preventative and early-intervention mental health support	IASC Reference Group for Mental Health and Psychosocial Support in Emergency Settings, 2021
8I. Resilience and Coping for the Healthcare Community (RCHC) programme	USA	Workforce mental health resilience intervention for emergency and health responders	Powell et al., 2022

combining specialist care with community-based, non-specialist early support. Case studies also suggest digital and telehealth delivery improves reach, particularly in rural and island communities. These approaches align with Scotland's Health and Social Care Partnerships whose main function is to plan and deliver integrated services, with a strong emphasis on preventative care, trauma-informed care agendas (e.g. NHS Education for Scotland's Roadmap for Creating Trauma-Informed and Responsive Change) and digital mental health strategies (e.g. Digital Mental Health Innovation Cluster, Scotland's Digital Mental Health Programme within the broader Digital Health & Care Strategy). Embedding psychosocial support into resilience and recovery structures may strengthen continuity of care and improve overall wellbeing. In Scotland, Community Link Workers (non-clinical, primary care-based practitioners who support patients with social stressors such as, housing, isolation, and mental health) could assist in providing support in relation to flooding and its secondary stressors, where needed.

3.2.9 Housing & Financial Security Interventions

This group of interventions involves measures that reduce post-flood financial and/or housing instability, a major driver of distress and secondary stressors. Examples include rapid rehousing with integrated mental health support; financial assistance delivered with wellbeing advice; and support for renters and uninsured households. Rapid rehousing, emergency grants and streamlined insurance/legal support are treated as mental-health interventions because they remove chronic secondary stressors that prolong negative mental health and wellbeing impacts. One case study (9E) aligns more with preparedness rather than response: the insurers digital app trial to support customers in high flood risk areas to prepare for future flooding (Table 10). The various pathways that negative mental health and wellbeing impacts from flooding may be reduced include via reduced stress, fear and loss of control as a result of decreased financial instability; faster emotional recovery; and protection against long-term harm. Typical policies linked include housing, social security, health and local government.

There is evidence linking housing insecurity to mental ill-health (Talmatzky *et al*., 2026) and disaster studies consistently show displacement as a major risk factor. Housing stability is therefore one of the strongest protective factors. Case studies from Australia, New Zealand, Ireland and the UK suggest that voluntary relocation, property buyouts, resilient rebuilding grants and integrated financial support may reduce long-term distress by removing repeated exposure and uncertainty. Managed retreat, when embedded in law and paired with compensation, community engagement and psychosocial support, reframes relocation as planned adaptation, rather than failure. These interventions operate through structural risk removal and stability pathways.

Policy relevance for Scotland: Housing, land-use and financial security policies function as upstream mental health interventions by reducing repeated exposure, displacement, financial impacts and uncertainty. Case studies show the value of non-physical measures, including voluntary relocation, insurance, property-level flood resilience measures and buyouts, when supported by

Table 10: Case Studies - Housing & Financial Security 9A-9E (see Appendices for detail).

Case Study	Region	Intervention	Reference
9A. Housing & Land for Flood Resilience, NSW	Australia	Structural risk reduction and recovery	New South Wales Government, 2025a, 2025b
9B. Managed Retreat as National Climate Policy	New Zealand	Strategic, planned managed retreat, anticipatory relocation and land-use transformation as a climate adaptation measure	Ministry for the Environment, 2022
9C. Flood Risk Management Sectoral Adaptation Plan	Ireland	National flood risk governance and adaptation framework including voluntary relocation scheme & individual property protection funding	Department of the Environment, Climate and Communications, 2024; Office of Public Works, 2025
9D. Mental Health Support for Flood-Affected Policyholders, Zurich	UK	Post-disaster psychosocial support, private-sector mental health intervention, insurance-linked wellbeing support	Goering, 2021
9E. Aviva	UK	Private sector intervention, digital app to support customers in high flood risk areas to prepare for future flooding	Building Future Communities, Aviva, 2025

clear governance and framed as humanitarian adaptation. Transferable elements for Scotland could include a national interdepartmental flood policy coordination mechanism via a dedicated working group, explicit recognition of non-physical options, risk-based eligibility using flood data, and local authority delivery with national oversight. Despite over 280,000 Scottish properties at flood risk (Scottish Government 2024a), estimates suggest only 3% of households have installed any flood protection measures (Scottish Government, 2025b). People living on lower incomes and in rented accommodation are also less likely to have access to flood insurance and have more limited capacity to appropriately prepare for, and recover from, flood events. This includes, for example, taking action to adapt their homes (Sayers *et al*, 2023), so addressing inequalities is key. There is clear need for a resource that increases awareness and supports preparedness amongst households at risk. The Scottish Household Flood Plan, funded by the Scottish Government, is a low-cost resource that seeks to encourage preparedness. It has recommended prioritising dissemination of the plan to those in social housing, as they are particularly vulnerable to hidden costs from flooding impacts (Henderson *et al*., 2026). There is also an urgent need to address research and innovation challenges necessary for increased UK-wide property flood resilience adoption and uptake, reflected by a recent (February 2026) UK Research & Innovation research call.

3.3 Workstream 2: Policy Mapping

This section is intended as an initial, exploratory overview to illustrate emerging insights, rather than to draw firm conclusions or recommendations; it reflects a preliminary assessment and has not been informed by stakeholder consultation. Given time and resource constraints the map does not include the extent of all relevant Scottish policy areas and strategies. As such, it should be viewed as a starting point for further work, with future stages providing opportunities to build on these initial findings through additional analysis, wider engagement, and more comprehensive consideration of the system as a whole.

The policy review detailed above (section 3.2) was complemented by an initial policy mapping exercise. It aimed to address the question 'how could different policy areas in Scotland connect and work together to address impacts of flooding on mental health and wellbeing?'. The resulting policy map is a preliminary interrogation of the interaction of Scottish strategies and policies addressing the mental health and wellbeing impacts of flooding, in order to provide a high-level understanding of the current policy landscape, including some of the policies referred to in earlier sections. A thematic analysis of these directly relevant strategies, policies, and related documents highlighted the interconnections of the policies which explicitly act upon mental health impacts in flood risk areas. The policy map visualises the complexity of these connections across the included documents which have a shared goal of reducing the impacts of flood risk and/or flood events on mental health.

The policy map (available by following this link) shows the relationships between the principles or challenges related to reducing the impacts of flooding on mental health identified in the selected policy strategies across health and climate, and how these principles or challenges could link with specific policy actions.

3.4 Key Findings from the Policy Review and Mapping

Mitigating the mental health impacts of flooding requires coordinated action across flood risk management, public health, housing, planning, education and community policy, with a shift from short-term recovery to long-term adaptation, prevention and equity. Yet global evidence shows mental health remains weakly embedded in climate adaptation policy. Most national plans either omit it, or mention it without actionable measures, and only a small minority of countries integrate mental wellbeing meaningfully into adaptation frameworks. Drawing on international case studies, nine categories of cross-policy interventions emerged that are relevant to Scotland: system-level governance that aligns sectors; planning and prevention that embeds wellbeing into statutory flood and spatial planning; structural and environmental measures that deliver psychological as well as physical protection; safeguarding continuity of health and social care infrastructure; preparedness and risk communication that reduces anticipatory stress; community participation that builds agency and social support; equity-focused approaches for high-risk groups; embedded health and psychosocial support during response and recovery; and housing and financial security measures that reduce secondary stressors such as displacement and debt. Together, these actions show that adapting to floods can also support public mental health, when wellbeing is treated as a key part of resilience, not an afterthought.

The exploratory policy mapping was used to provide an initial high-level understanding of the existing policy landscape in Scotland, illustrating potential links and interconnections between different Scottish policies addressing the impacts of flooding on mental health and wellbeing. The approach taken identifies which of the included policy actions appear to have the most connections, and therefore represent cross-policy actions that could support the delivery of a wider range of principles set out across a wider range of strategy documents.

For example, the desired policy action to "develop trauma-aware guidance and recovery planning", had the most connections and links directly to actions listed in the PHS Adverse Weather and Health Plan 2024-2027, including the development of a comprehensive collection of guidance on protecting public health during adverse weather events, for professionals in Scotland. It also connects to the UK Climate Change Risk Assessment via the acknowledged principle that there is a need to consider psychological recovery in post-flood recovery plans; to Scotland's Population Health Framework 2025-2035 via the principle of embedding climate and environmental considerations into health and wellbeing policies and by integrating health into climate policies; and to the Mental Health & Wellbeing Strategy via the vision that the mental health and wellbeing workforce are valued and supported to provide effective, person-centred, trauma-informed, rights-based compassionate services and support. Addressing this specific action could therefore help achieve effective cross-policy integration in Scotland, using frameworks and strategies already in place across the climate and health sectors (such as the Health in all Policies approach), to mitigate the negative mental health and broader wellbeing impacts of flooding.

This aligns with evidence from the Workstream 1 systematic review, which found that, psychosocial interventions implemented during the flood recovery stage were linked to reductions in psychological distress, anxiety, depression, and PTSD symptoms. The policy review of case studies also identified more examples within the health and psychosocial support intervention category compared to others (see appendices 8A-I), including approaches that embed mental health within flood response, such as psychological first aid and trauma-informed primary care and community services. This supports a recommendation to develop trauma-aware guidance and recovery planning for flood events.

A number of desired policy actions showed moderate connections. These included supporting community-focused interventions, such as climate action hubs, to host climate cafes and facilitate mental health conversations around climate change. This action aligns directly to the Scottish National Adaptation Plan and the Mental Health & Wellbeing Strategy, particularly through two principles that recommend better equipping communities to provide connection and support, and that global challenges, such as climate change, can increase anxiety and distress, especially for those already at risk.

Evidence from the literature suggests that community-based interventions were associated with improved coping, reduced isolation, and better perceived wellbeing, largely through strengthened social networks and collective recovery processes. Case studies also suggest that locally embedded resilience hubs may help to reduce helplessness, strengthen social support networks, and improve recovery outcomes. Community-based interventions such as these could build on existing cross-policy mechanisms of place-based resilience that appear in many of the strategies, and could therefore help to develop those cross-policy connections further.

Another action with moderate connections was the development of flooding and health communication toolkits for NHS health boards. This connection directly supports 1) an action in the Public Health Scotland Plan 2024-27, 2) the UK Climate Change Risk Assessment via the principle of increasing capacity to respond to climate-related mental health impacts, and 3) Scotland's Population Health Framework via the principle of embedding climate and environmental considerations into health and wellbeing policies. While evidence of the effectiveness of preparedness-based interventions is limited, the case studies suggest that clear, trusted, and actionable flood risk communication can reduce psychological stress as well as physical harm by integrating mental health and wellbeing messaging, service sign-posting and practical guidance into warnings. Examples of such cross-policy actions include embedding mental health and wellbeing messaging into SEPA flood warnings and Local Flood Risk Management Plans.

4.0 Recommendations

This section brings together the findings from both Workstreams to develop recommendations for policy, practice and research (Table 11). Effectively mitigating the detrimental impact of flooding on mental health and wellbeing requires coordinated action across sectors, and along the flood adaptation, preparedness, response and recovery pathways, as well as primary, secondary and tertiary public health prevention (Figure 1).

4.1 Policy and Practice

Adaptation & Preparedness Pathway:

The adaptation and preparedness pathway centres on embedding mental health and wellbeing considerations into all aspects of flood risk governance and planning through a coordinated, cross-sectoral approach. This also aligns with primary prevention within a public health approach, that aims to prevent mental health problems in the first place. A National Flood and Public Health Framework (incorporating mental and physical health), underpinned by a Health in All Policies (HiAP) model, would enable stronger alignment between sectors by integrating public health expertise into flood adaptation, planning and preparedness structures, such as local resilience partnerships. Alongside this, the development of a comprehensive flooding and public health communication toolkit would equip health and social care professionals with the knowledge and skills to understand and address the health impacts of adverse weather events, while also supporting wider use by organisations and community groups. Embedding mental health and wellbeing indicators (including inequalities) within Local Flood Risk Management Plans, development planning, and building standards would help ensure that issues such as flood-related anxiety, repeated exposure, displacement, and disproportionate impacts on vulnerable populations are systematically prioritised and addressed. Complementing this, the inclusion of Health Impact Assessments in flood mitigation schemes would allow for the identification of psychosocial risks and the creation of co-benefits for wellbeing through thoughtful design and community engagement, representing a HiAP approach to flood adaptation planning, and aligning with the public health prevention agenda. Investment in multifunctional green and blue infrastructure, combined with clear, trauma-informed communication strategies and psychological preparedness training for all responders, could further strengthen resilience. At the community level, a structured framework for supporting local resilience through initiatives such as Climate Hubs, community-led programmes, and accessible advice services, could empower individuals and groups to engage with both climate and mental health challenges in a proactive and supported way.

Response & Recovery Pathway:

The response and recovery pathway focuses on strengthening systems to identify, address, and mitigate the mental health impacts of flooding in both the immediate aftermath and longer term. This phase also aligns with secondary and tertiary prevention within public health that aim to support early intervention and reduce the level of harm, and minimise the negative consequences of a health issue through careful management. Establishing a national adverse weather and health surveillance system, inclusive of mental health and wellbeing outcomes (including inequalities), could enable timely identification of need and facilitate rapid referral pathways, particularly for those with pre-existing health conditions. Community-based responses, including the provision of mental health support at rest centres and the deployment of Psychological First Aid, could help ensure that emotional as well as physical needs are addressed during emergencies. Training all responders to recognise and manage psychological distress, supported by supervision and peer support, could help prevent burnout and secondary trauma among frontline staff. Trauma-informed guidance, timely access to mental health supports and services, where required, especially in rural or underserved areas, and coordinated practical support such as housing, insurance, and financial assistance, delivered in a way that minimises distress for displaced populations is also important during the recovery phase. Strategic prioritisation of funding for flood-resilient retrofits in vulnerable areas, informed by Health Impact Assessments, could promote equitable post-flood retrofits. School-based recovery programmes in affected areas could play a role in addressing and reducing long-term psychological impacts among children and young people, but requires further evaluation, alongside the other recommendations made here.

Table 11: Recommendations.				
Action	**Timescale**	**Intended Outcome**	**Flood Pathway**	**Evidence Strength**
Policy				
1. Integrate mental health messaging and service signposting into SEPA flood alerts and Local Flood Risk Management Plans	Short	Reduced anticipatory stress; improved help-seeking	Adaptation & Preparedness	Promising but limited evidence
2. Embed Psychological First Aid (PFA) and trauma-informed training in civil contingencies planning	Short	Reduced acute distress and escalation to PTSD	Adaptation & Preparedness; Response & Recovery	Promising but limited evidence
3. Develop a flooding and public mental health communication toolkit/resource	Short	Provide training resource for health & social care staff and community organisations on mental health and wellbeing implications of flooding	Adaptation & Preparedness	Promising but limited evidence
4. Implement proactive outreach to displaced households post-flood	Short	Reduced depression, anxiety and PTSD linked to displacement	Response & Recovery	Promising but limited evidence
5. Strengthen coordination between housing, insurance, welfare and health services during recovery	Short	Reduced secondary stressors; improved recovery trajectories	Response & Recovery	Moderate observational evidence
6. Optimise the timing and wording of flood warnings to improve clarity and responsiveness, whilst minimising anticipatory stress	Short	Reduced risk of adverse mental health outcomes following flood exposure	Adaptation & Preparedness	Moderate observational evidence
7. Account for mental health and wellbeing benefits in the appraisal of flood mitigation schemes	Medium	More accurate cost–benefit analysis; increased prevention investment	Adaptation & Preparedness	Strong rationale
8. Offer and improve access to property-level resilience grants in high-risk areas	Medium	Reduced long-term mental health deterioration; improved perceived safety	Adaptation & Preparedness	Promising but limited evidence; equity rationale strong
9. Develop targeted support pathways for vulnerable groups (e.g. low-income, disabled, pre-existing health conditions, remote/rural), such as via Community Link Workers	Medium	Prevent widening of mental health inequalities post-flood	Response & Recovery	Limited evidence; equity rationale strong
10. Embed mental health indicators into Local Development	Medium	Mainstreamed prevention and cross-policy integration	Adaptation & Preparedness	Strong rationale
11. Invest in sustained community resilience programmes beyond immediate response phase	Medium	Sustained social capital; reduced long-term distress	Adaptation & Preparedness; Response & Recovery	Moderate observational evidence
12. Ensure access to timely mental health supports and services, where required, especially for rural and displaced populations	Medium	Improved access and continuity of care; prevention of mental health deterioration	Adaptation & Preparedness; Response & Recovery	Moderate evidence; strong rationale
13. Develop and design multi-functional green/blue flood infrastructure that delivers co-benefits for mental health and wellbeing	Medium	Everyday stress reduction	Adaptation & Preparedness	Evidence gap
14. Integrate mental health explicitly into the National Flood Resilience Strategy: development of National Flood & Mental Health Framework	Long	Whole-system alignment; upstream prevention	Adaptation & Preparedness	Policy logic strong
Research				
15. Strengthen data systems and longitudinal monitoring of mental health and wellbeing outcomes in relation to flooding	Long	Evidence-informed policy, improved targeting and evaluation capacity	Adaptation & Preparedness	Strong rationale
16. Increase quasi- and natural experiment evaluations of adaptation and equity-focused interventions	Long	Stronger causal evidence for policy investment in Scottish context	Adaptation & Preparedness	Critical research gap

4.2 Research

Future research should prioritise methodologically robust evaluations to strengthen the evidence base on how flood-related interventions influence mental health and wellbeing. Greater use of longitudinal and quasi-experimental designs, including natural experiments, is needed to improve causal inference and to assess short-, medium-, and long-term mental health and wellbeing trajectories. This should include examination of acute post-event impacts, but also of the longer-term mental health consequences of living with ongoing flood risk, including chronic or anticipatory flood anxiety, or broader climate anxiety. Adaptation and preparedness interventions, such as early warning systems, property-level resilience measures, community preparedness initiatives, and risk communication strategies remain under-represented in the literature and warrant systematic evaluation. Research should also assess how different flood adaptation infrastructure influences psychological outcomes, and how housing displacement, particularly duration, stability, and housing quality shapes mental health recovery. There is also a lack of theory-based and process evaluation of interventions, such as contribution analysis, which may help to establish to what extent, and in what circumstances, an intervention contributes to the desired outcomes, especially in cases where experimental and quasi-experimental studies are not possible, and causality is difficult to establish.

Greater consistency in the indicators used and conceptual clarity in outcome measurement is essential. There is a need to have time-sensitive mental health and wellbeing indicators (for example, similar to the Small Area Mental Health Index in England (Daras and Barr, 2020)) which can also be built into flood resilience monitoring and evaluation strategies and systems. Additionally, the development of a Scotland-specific flood vulnerability index, which incorporates mental health and wellbeing, would enable a more nuanced understanding of intersecting risks. Future studies should employ validated tools and capture both adverse outcomes (e.g. psychological distress, anxiety, depression) and positive indicators of wellbeing, resilience, and recovery. There is a need for stronger representation and subgroup analyses of vulnerable and high-risk populations, including people with pre-existing health conditions, low-income households, children and older adults, and those exposed to repeated flooding. In a Scotland-specific context, research should explicitly examine equity and intersectionality, considering how flood impacts interact with other aspects of inequality, such as deprivation, disability and multimorbidity, ethnicity, gender, and age. Expanding the flood-specific mental health evidence base for children and young people is also important, as is generating place-sensitive evidence that reflects the distinct recovery pathways and service contexts of rural, island, and coastal communities.

To enhance policy relevance and transferability, future studies should provide clearer descriptions of intervention components and processes, implementation contexts, and underlying mechanisms of action. Robust evaluations of integrated, cross-sector approaches, combining health, socio-economic, community, housing, and property-level strategies would be particularly valuable in reflecting the complex determinants of mental health and wellbeing in flood settings. However, this requires cross-sectoral data (e.g. individual or area-level mental health and wellbeing indicators, insurance-related data, socio-economic indicators, and details of flood adaptation measures), which are often difficult to gather and/or access, hindering evaluation efforts. **Therefore, investment in strengthening and co-ordinating data systems across sectors for flooding (and other climate hazards), mental health and wellbeing in Scotland is crucially needed.** Stakeholders and researchers should ensure that the results of any evaluation of interventions conducted are easily findable and openly accessible. High-quality mixed-methods research should also be prioritised to capture both measurable psychological outcomes and lived experiences, thereby producing more comprehensive evidence to inform flood resilience, risk reduction, and climate adaptation policy. Evidence could also be drawn from studies evaluating the effectiveness of interventions to address other climate hazards (e.g. heat, cold and wildfires) in Scotland in order to assess transferability to the flooding context. Finally, future research should look to develop a comprehensive systems map that encompasses all possible policy areas and drivers of housing, environmental, and health inequalities that can affect experiences of, and responses to, flooding and mental health.

5.0 Conclusions

Addressing the mental health and wellbeing impacts of flooding requires careful coordinated action across sectors. This will ensure that flood resilience in Scotland supports not only physical protection, but also the mental wellbeing of individuals and communities, as well as health equity. The findings demonstrate that psychological harm is not inevitable. Aligning flood risk management with health, housing, planning and community systems, can help protect mental wellbeing. **A shift from reactive recovery towards more wellbeing-centred adaptation is both achievable and increasingly important as flood risk intensifies, though it will require sustained commitment, clearly defined roles and responsibilities, strengthened and co-ordinated data systems, as well as system wide buy in.**

Scotland already possesses most of the statutory powers and delivery mechanisms required to mitigate the mental health impacts of flooding. Cross-policy action within a shared framework would help support a move towards more resilience-centred adaptation.

Across the literature and case studies presented, core components of effective cross-policy action include:

1. **Health in all policies** – mental health and wellbeing considered in public policy at all stages
2. **Community participation** – community empowerment and co-production
3. **Integrated recovery** – housing, income security, and mental health addressed together
4. **Place-based approaches** – recognise rural, island, and coastal differences, as well as historical and cultural variation

The evidence base supports a shift from siloed responses toward integrated, adaptive and place-based systems that treat flood adaptation as both a climate and public mental health priority. Scotland is well positioned to adopt and develop these approaches through existing governance, planning and health systems and data. However, there is an urgent need for evaluation of integrated, cross-sector approaches, combining health, socio-economic, community, housing, and property-level interventions in a Scottish-specific context.

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Appendices

Appendix 1.1 (Workstream 1): Methodological details

Eligibility Criteria

Eligibility criteria were defined using the Population, Intervention, Comparator, Outcomes (PICO) framework (Schardt *et al*., 2007). The review included studies of individuals or communities exposed to, or at risk of, flooding of any type (including fluvial, pluvial, coastal, and flash flooding). Eligible studies were those conducted in countries with geographic and socio-economic characteristics comparable to Scotland, including OECD (Organisation for Economic Co-operation and Development) countries with a temperate oceanic climate (Köppen–Geiger Cfb classification) (Peel *et al*., 2007), across Europe and selected regions in Australasia, North America, and East Asia.

All interventions with potential impacts on mental health or wellbeing were eligible, including interventions aimed at prevention and preparedness, as well as those aimed at recovery. Eligible interventions included a variety of models, such as socio-economic, health, property-level, nature-based, community-based, and early warning interventions. Comparators included no intervention, standard practice, or alternative interventions. Outcomes of interest were mental health, mental wellbeing, and mental illness, defined according to the Scottish Government terms (Scottish Government, 2023).

Peer-reviewed primary studies and relevant grey literature were included, using quantitative, qualitative, or mixed-methods designs. Reviews, dissertations, and conference abstracts were excluded. Only English-language studies published between January 2010 and December 2025 were considered.

Information Sources and Search Strategy

Searches (limited to English language articles) were conducted on 25th November 2025 across eight electronic databases via EBSCOhost, including PsycINFO, PsycArticles, CINAHL, GreenFILE, MEDLINE, SocINDEX, EconLit, and the Psychological and Behavioural Sciences Collection, covering the period 2010 to 2025. Grey literature was identified through targeted searches of pre-print servers (MedRxiv and PsyArXiv, conducted on 7th January 2026) and targeted searches for policy documents as part of Workstream 2 (see section 2.2). Additional searches of Semantic Scholar and OpenAlex were conducted on 25th February 2026 via Elicit (Lau and Golder, 2025; Whitfield and Hofmann, 2023). Search terms combined concepts relating to flooding, mental health and wellbeing, and interventions, using Boolean operators and truncation. The search strategy (see https://osf.io/f6wph/files/cx5ew) was developed in collaboration with an academic librarian.

Study Selection

Records were imported into Covidence for deduplication and screening. Two reviewers independently screened titles, abstracts, and full texts against the eligibility criteria. Disagreements were resolved through discussion or consultation with a third reviewer.

Data Extraction and Management

References were managed using Zotero. Data extraction was undertaken using Elicit (an Artificial Intelligence tool for data extraction) (Bernard *et al*., 2025; Whitfield and Hofmann, 2023), based on a predefined and piloted data extraction template. Extracted data were checked by two reviewers and additional data extracted manually where needed. Extracted information included study characteristics, sample, intervention type and timing, outcome measures, key findings and limitations. The data extraction template can be found on the project OSF website above.

Quality Appraisal

Study quality and risk of bias were assessed using an adapted version of the Mixed Methods Appraisal Tool (Hong *et al*., 2018). This included the screening questions and an overall quality assessment relevant to the appropriate study design (i.e., first item of the relevant study design's quality appraisal from the Mixed Methods Appraisal Tool). The limitations of each study were also recorded during the data extraction phase and used to inform the overall quality assessment.

Data Synthesis

Due to heterogeneity across study designs, interventions, and outcomes, findings were synthesised narratively. Synthesis was structured by intervention type, intervention phase (adaptation, preparedness, response, recovery), mental health and wellbeing outcomes, impacts on vulnerable groups, and relevance to the Scottish context, drawing on SWiM and thematic synthesis approaches (Campbell *et al*., 2020).

Appendix 1.2 (Workstream 1): Table summarising the 28 included studies

Table summarising the 28 included studies.

Reference	Country/ Region	Study design	Data source	Sample characteristics	Intervention type	Intervention point	Outcomes	Relevant Findings	Limitations	Key Points
(Andrews and Russo, 2022) Exploring the driving factors that influence the design, function, and use of urban wetlands in the United Kingdom. https://doi.org/10.1007/s13157-022-01610-1	United Kingdom	• Mixed methods • Cross-sectional (online survey) • Qualitative interviews with experts • Snowball sampling for survey participants • Convenience sampling for expert interviews.	• Online survey for general public • Structured interviews with urban wetland experts.	• 114 participants • Age: 50% in the 18 to 30-year-old age group; one participant over 80 years old • Location: Majority live in semi-rural areas (39%); 32% live in urban areas; rest in rural areas.	Community-based (urban wetland).	Flood preparedness, as one of the urban wetlands was created for flood control.	• Perceived importance of climate resiliency as a function of urban wetlands • Education and awareness about the benefits of urban wetlands.	• Participants would travel to visit urban wetlands for quality of life and wellbeing. • Climate resiliency perceived as important but not driving factor for urban wetlands studied. • The majority support community consultation in urban wetland design. • Thematic analysis revealed themes of wildlife conservation interest, landscape character development, and urban wetlands as amenity spaces.	• Opportunity & snowball sampling not representative • Limited opportunity for in-depth discussion in structured interview • Need for different recruitment methods for diverse participant pool.	Urban wetlands seen beneficial for wellbeing and quality of life Intervention can be preparatory But knowledge about wetlands (and benefits) still needs to be improved in non-experts.
(Bazart *et al.*, 2020) Improving relocation acceptability by improving information and governance quality/results from a survey conducted in France. https://doi.org/10.1007/s10584-020-02690-w	France; Mediterranean, English Channel, Brittany and Atlantic regions	• Quantitative • Cross-sectional • Experimental repeated measures design.	Questionnaire	• 198 Residents from coastal towns/ villages in mainland France • Balanced between men and women with 65% couples • 33% aged over 60, mostly retired • Average monthly income of €2453 • 48% have a higher education diploma.	• Communication strategies using fear or humour to influence relocation acceptability (social intervention) • Governance quality assessment and trust in institutions (governance-level intervention).	Preventative: involves presenting participants with humour-based or fear-based communication to assess its impact on relocation acceptability.	1. Relocation acceptability (scale 1 to 10) 2. Perception of political courage of mayors implementing relocation policies (scale from 1 to 10) 3. Willingness to participate in relocation funding (scale from 1 to 10).	• No significant difference in perceptions of flyer effectiveness • Humour-based communication induces a stronger emotional response but does not significantly impact relocation acceptability compared to fear-based communication. • Governance quality significantly influences relocation acceptability. • Psychological factors like control over measures and environmental awareness are crucial. • Relocation acceptability is higher among women and those valuing beach protection. • Willingness to pay taxes for relocation is influenced by governance quality, education level, and attachment to the sea.	• Difficulty in quantitatively evaluating governance quality due to limited studies • Reduced evaluation of governance quality to only two variables.	Message style (fear vs humour) less important Governance quality of local councils influential for relocation acceptability Humour evokes more emotional responses.

Reference	Country/ Region	Study design	Data source	Sample characteristics	Intervention type	Intervention point	Outcomes	Relevant Findings	Limitations	Key Points
(Bazart *et al.*, 2020) Improving relocation acceptability by improving information and governance quality/results from a survey conducted in France. https://doi.org/10.1007/s10584-020-02690-w	France; Mediterranean, English Channel, Brittany and Atlantic regions	• Quantitative • Cross-sectional • Experimental repeated measures design.	Questionnaire	• 198 Residents from coastal towns/ villages in mainland France • Balanced between men and women with 65% couples • 33% aged over 60, mostly retired • Average monthly income of €2453 • 48% have a higher education diploma.	• Communication strategies using fear or humour to influence relocation acceptability (social intervention) • Governance quality assessment and trust in institutions (governance-level intervention).	Preventative: involves presenting participants with humour-based or fear-based communication to assess its impact on relocation acceptability.	1. Relocation acceptability (scale 1 to 10) 2. Perception of political courage of mayors implementing relocation policies (scale from 1 to 10) 3. Willingness to participate in relocation funding (scale from 1 to 10).	• No significant difference in perceptions of flyer effectiveness • Humour-based communication induces a stronger emotional response but does not significantly impact relocation acceptability compared to fear-based communication. • Governance quality significantly influences relocation acceptability. • Psychological factors like control over measures and environmental awareness are crucial. • Relocation acceptability is higher among women and those valuing beach protection. • Willingness to pay taxes for relocation is influenced by governance quality, education level, and attachment to the sea.	• Difficulty in quantitatively evaluating governance quality due to limited studies • Reduced evaluation of governance quality to only two variables.	Message style (fear vs humour) less important Governance quality of local councils influential for relocation acceptability Humour evokes more emotional responses.
(Bokszczanin, 2012) Social support provided by adolescents following a disaster and perceived social support, sense of community at school, and proactive coping. https://doi.org/10.1080/10615806.2011.622374	Southern Poland, Piechowice	• Longitudinal study • Quantitative natural experiment.	• Primary data from two public in a flood-affected area • Questionnaires distributed to students at two different times (N=266 T1 and N=104 T2).	• Adolescents aged 13-21 years • 37% girls, 63% boys • Average age: Girls - 16.21 years, Boys - 17.25 years • Majority (83%) are residents of the town, 17% from surrounding villages.	• Social support intervention: Adolescents provided tangible, emotional, and informational support to others during and after flood. • e.g., helping protect property, cleaning/ repairs, consoling others, providing information.	• Acute response and recovery phases with data collection occurring at eight months and almost two years after the flood.	• Perceived social support • Sense of community at school • Proactive coping: assessing self-determined goal setting and proactive behaviors.	• 82% of participants said they helped someone in need after flood. • Higher levels of social support provided by adolescents after a flood were significantly correlated with higher levels of perceived social support (.62) and a stronger sense of community at school (.19). • Null findings for the association with receiving social support.	• The sample was not highly exposed to the disaster, which might limit findings on received support. • The study cannot support causal links due to the lack of pre-disaster assessments. • Limited exposure to disaster stressors in the sample. • Attrition between time points.	Providing social support predicts higher perceived social support for oneself Providing social support predicts stronger sense of community.

Reference	Country/ Region	Study design	Data source	Sample characteristics	Intervention type	Intervention point	Outcomes	Relevant Findings	Limitations	Key Points
(Butler *et al*., 2018) Narratives of recovery after floods: Mental health, institutions, and intervention. https://doi.org/10.1016/jsocscimed.2018.09.024	England: Somerset, South West England	• Longitudinal, qualitative • Narrative approach.	• Primary data: semi-structured interviews with 9 individuals affected by floods • Conducted over a fifteen-month period.	• Gender: approximately even distribution • Age: two thirds of the sample were aged 64 or over.	• Property-level interventions: Major land and river management works (e.g., river dredging, raising roads) • Health interventions: Community mental health services, talking therapies, programs for treating post-traumatic stress • Community-based interventions: Village agents providing support and facilitating communication • Support continued for a prolonged period after the initial flood.	• Recovery phase, starting six months after the floods.	• Role of institutional support in affecting mental health recovery journeys, over a 15-month period.	Qualitative themes: 1. Institutional actions and inactions: • Institutional support impacts individuals' mental health and recovery after floods (includes e.g., timely warnings, evacuation support, etc). • Both institutional actions and perceived lack of support affect mental health • Poor or untimely evacuations can be detrimental to mental health due to inadequate support and information. 2. Limitations to community support in recovery processes • Community support is important to help cope after floods, but insufficient on its own to mitigate mental health impacts. • Enabling self-support and community action can increase resilience and alleviate mental health burdens.	• Limited research on relationships between agencies and affected publics • Limited evidence on diverse forms of experience in person-centred approaches • Existing support structures are often not accessed by those in need • Support for mental health is not universally available • Narrative approach may have limitations in generalizability or depth.	Institutional support (e.g., by emergency services) important for mental health recovery (incl. timely warning, evacuation support, communicating info) Community support is important but on its own insufficient to alleviate mental health burdens from floods.

Reference	Country/ Region	Study design	Data source	Sample characteristics	Intervention type	Intervention point	Outcomes	Relevant Findings	Limitations	Key Points
								3. Recovery, institutional responses, and identity • Identity played key role in determining whether/ how much support individuals sought or requested. • Empowering communities may increase help-seeking in community members. 4. Institutional support and perceptions of the future • Institutional support is crucial for long-term mental health outcomes, facilitating better recovery processes.		
(Carroll *et al*., 2010) Health and social impacts of a flood disaster: Responding to needs and implications for practice. https://doi.org/10.1111/j.1467-7717.2010.01182.x	England, Cumbria, Carlisle	Qualitative study using semi-structured focus group and individual interviews.	• Primary data collection: In-depth, individual and focus-group interviews with people whose homes had been flooded and with agency workers. • Administrative data source: City Council's database of flooded properties. • Secondary data sources: BBC Radio Cumbria Health Survey, Communities Reunited Health Survey, articles in The Cumberland News.	• Men and women aged 30-70 • 14 men and 26 women • Mix of people whose homes had been flooded and agency workers who had helped people affected by flooding • Interviews and focus groups also supplemented by data from BBC Radio Cumbria Health Survey (sample: 64; six months after the floods) and the Health and social impacts of a flood disaster and the Communities Reunited Health Survey (sample: 213; 10 months after the floods).	Community-based interventions: Financial support from Cumbria Community Foundation to 697 individuals and 51 organisations; assistance with insurance disputes and housing benefit issues through community agencies.	General policies to support people impacted by flooding (e.g. financial, help with housing, flood warning information).	• Flood risk awareness • Physical health • Mental health • Impact on frontline support workers.	• Respondents and support workers experienced psychological stress due to the floods. • Issues with flood risk awareness and preparedness were noted • Psychological impacts included anxiety, stress, depression, and PTSD symptoms. • Support workers faced overwork, exhaustion, and stress.	• Lack of systematic monitoring of health impacts • Ad hoc nature of support services • Not representative, anecdotal accounts.	Flood restoration and repair measures often increased mental burden (e.g., insurance disputes; house repairs taking longer thus elongating displacement) Helpful interventions included: drug prescriptions from GPs, practical advice, community shelters (incl. food, water, shelter), city council providing health and emotional support, charity projects (e.g., art project for youth).

Reference	Country/ Region	Study design	Data source	Sample characteristics	Intervention type	Intervention point	Outcomes	Relevant Findings	Limitations	Key Points
(Dootson *et al.*, 2023) Using videos in floods and bushfires to educate, signal risk, and promote protective action in the community https://doi.org/10.1016/j.ssci.2023.106166	Australia	• Cross-sectional • Mixed methods (quantitative and qualitative)	• Secondary data: Videos sourced from Australian emergency services agencies and news organizations. • Primary data: Survey data collected from participants recruited through Qualtrics market research panel.	• Adults aged 18 and above • Approximately even gender distribution (57% female, 0.2% other) • Majority spoke English as their primary language at home (92%) • 9% had a household member who was a current or previous member of an emergency service agency • Age distribution: 18–24 years (13%), 25–34 years (16.8%), 35–44 years (17.3%), 45–54 years (17.5%), 55–64 years (15.5%), 65–74 years (15%), 75 years or older (4.9%)	Community-based: Use of videos sourced from emergency services agencies and news organizations to educate the public about hazards and promote protective actions.	• primarily preventative, focusing on education and preparedness for floods and bushfires. • intervention is administered during the preparation phase to improve community knowledge and risk perceptions, with some aspects relevant to the response phase for triggering risk perceptions and promoting protective actions.	• Hazard knowledge improvement: Measured through self-reported changes in understanding of flood and bushfire facts. • Risk perception increase: Assessed through self-reported changes in perceived risk of floods and bushfires • Protective action intentions: Measured through self-reported changes in intended preparatory and response actions.	• Videos with fewer facts and those using visualizations or infographics are most effective at improving hazard knowledge. • Videos highlighting the impact of emergencies through personal experiences improve hazard knowledge, risk perceptions, and protective action intentions. • The type of visual content used significantly impacts learning, risk perception, and protective action intentions. • The study provides practical implications for emergency management in designing and timing video content for different stages of natural hazard emergencies. • The research addresses the interaction between textual and visual information on behavioral outcomes, highlighting the effectiveness of visuals in communicating risk.	• The study lacks longitudinal research to assess knowledge retention over time. • The measurement of perceived risk and coping appraisal had limitations due to general pre-stimuli measures and potential biases in post-stimuli measures. • The study measured protective action intentions rather than actual behaviour.	Flood preparation communication with fewer facts and more visuals, highlighting personal experiences are more effective at improving hazard knowledge and Most videos Increased perceived coping appraisal

Reference	Country/ Region	Study design	Data source	Sample characteristics	Intervention type	Intervention point	Outcomes	Relevant Findings	Limitations	Key Points
(Garde-Hansen *et al.*, 2017) Sustainable flood memory: Remembering as resilience. https://doi.org/10.1177/1750698016667453	South West of England; lower Severn Valley	• Longitudinal (2010-2013) • Comparative study design (studied four floodplain settings) • Qualitative (memory work, visual ethnography, archival research, oral history interviewing) • Non-random sampling (snowballing and quota approach) • Thematic analysis	• Primary data: In-depth interviews with 65 residents • Secondary data: Archives (official and unofficial), demographic data from census records.	• Mixed gender • Age range: 18-25 and 26-40 age groups • Mixed demographic of ages and social classes • Majority owner-occupied in some settings (e.g., Setting 1: 68.4%, Setting 2: 87.9%, Setting 4: 82.4%) • Ethnic minorities present in some settings (e.g., Setting 1: 1.7%, Setting 3: 14.4%)	Community-based interventions: • Memory work • Visual ethnography • Archival research • Oral history interviewing • Digital and social media for personalized and networked digital storytelling and web-based applications	The intervention point was after the 2007 floods, from 2010 to 2013, and was related to flood preparedness and resilience building rather than an acute response or recovery phase.	• Development of lay knowledge • Creation of social learning opportunities for adaptive capacities and flood resilience • Evaluation of the role of flood memories in fostering resilience • Understanding active remembering and forgetting practices • Community ownership of flood materialization • Childhood memories and emotional responses • Active forgetting by businesses and organizations • Organizational memory practices among stakeholders	• Shared memories and lay expertise were found to enhance community resilience. • Setting 4, with its long history of flooding and strong community bonds, was the most resilient. • Active forgetting was identified as a significant issue, influenced by emotional and affective factors. • Community ownership of flood materialization is crucial for resilience.	• Difficulty in engaging younger age groups (18-25 and 26-40) in the research • Limited analysis of the relationship between memory and archival evidence.	Community resilience enhanced through shared memories and shared lay expertise Also important for Community resilience was community ownership of flood materialization

Reference	Country/ Region	Study design	Data source	Sample characteristics	Intervention type	Intervention point	Outcomes	Relevant Findings	Limitations	Key Points
(Harries, 2012) The anticipated emotional consequences of adaptive Behaviour—Impacts on the take-up of household flood-protection measures. https://doi.org/10.1068/a43612	England	Cross-sectional, quantitative, secondary analysis of survey data	Telephone survey commissioned by Defra in 2007	• Sample size: 555 participants • Experience of flooding: A quarter of participants had experienced flooding • Type of housing: Higher proportion of bungalows, flats, and mobile homes • Tenure: Fewer social tenants compared to national averages • Household composition: Fewer households with children • Employment status: Higher proportion of self-employed and economically inactive individuals	• Property-level interventions: Installation of airbrick covers, deployable door-guards, sealing of entry points for water pipes and electricity supplies. • Economic interventions: Grant scheme for flood protection, use of insurance terms as incentives.	• Flood preparedness and prevention, focusing on emotional barriers and incentives to adaptation.	• Primary outcome: Influence of beliefs on protective behavior • Specific focus: Role of anticipated emotions (anxiety and feelings of insecurity) • Self-reported: Yes	• Protective measures (incl. insurance, moving to higher ground) did not significantly predict feelings of safety (exp(B) = 2.05, p = .1) • Protective behaviour is influenced more by emotional considerations (anxiety and insecurity) than financial considerations. • Beliefs about emotional consequences of protective measures and reliance on insurance are significant predictors of protective behaviour. • Risk perception and beliefs about future flooding are correlated with protective behaviour. • Experience of flooding increases the likelihood of taking protective measures, mediated by beliefs about anxiety and insurance.)	• Dataset did not cover all elements of the model thoroughly. • Questions were not cognitively tested before inclusion in the survey. • Limitations in survey methodology due to telephone surveys. • Difficulty in determining causality.	Protective measures (e.g., insurance, relocation) NOT significantly linked to feelings of safety

Reference	Country/ Region	Study design	Data source	Sample characteristics	Intervention type	Intervention point	Outcomes	Relevant Findings	Limitations	Key Points
(Kaniasty, 2012) Predicting social psychological well-being following trauma: The role of postdisaster social support. https://doi.org/10.1037/a0021412	Poland, southwestern region, city of Opole and surrounding villages.	Longitudinal, mixed methods.	Primary data: interviews with people who experienced a severe flood in southwestern Poland in 1997. Data collected in two waves: Wave 1 at 12 months post-flood (N=285) and Wave 2 at 20 months post-flood (N=250).	• Gender: 184 women, 101 men • Age: Average 48 years, range 18-87 years • Education: Average 12 years of formal schooling (equivalent to completed high school) • Marital status: 70% married or in a lasting relationship • Residential distribution: 29% in ground-level apartments, 25% in higher floors, 46% in single-family dwellings in villages.	Social and community-based interventions (involvement in postdisaster altruistic communities and social support processes).	Recovery phase: measured community social support, as recalled shortly after flood.	• Perceived social support: Measured using the Provisions of Social Support Scale • Postdisaster community cohesion: Measured with 11 items assessing communal solidarity and sense of community • Withdrawal from interpersonal contacts: Assessed with four questions about reduction in socializing • Beliefs in benevolence of people: Measured using four items from the World Assumptions Scale • Beliefs in efficacy of mutual helping: Measured with four items assessing attitudes toward helping	• Withdrawal from interpersonal contacts negatively correlated with benevolence of people (-.40), efficacy of mutual helping (-.33), community cohesion (-.31), and perceived social support (-.24) • Greater involvement in postdisaster altruistic communities was associated with more favourable appraisals of interpersonal and community relationships. • Indicators of postdisaster social bitterness predicted lower levels of subsequent social psychological well-being • Postdisaster social bitterness had a more significant impact on social psychological well-being than social support mobilization.	• Reliance on retrospective self-reports which could be influenced by psychological distress • Potential for negativity rooted in distress affecting evaluations of post-disaster social support and relationships.	Community cohesion, People's benevolence, effective mutual helping and perceived social support all linked to less social withdrawal involvement in post-flood altruistic communities linked to better relationship quality.

Reference	Country/ Region	Study design	Data source	Sample characteristics	Intervention type	Intervention point	Outcomes	Relevant Findings	Limitations	Key Points
(Lamond *et al.*, 2015) An exploration of factors affecting the long term psychological impact and deterioration of mental health in flooded households https://doi.org/10.1016/j.envres.2015.04.008	England	• Cross-sectional • Quantitative	• Primary data through a postal survey of households flooded during 2007 flood event in England. • Participants selected using insurance claims database.	• Owner-occupied households • Respondents reported on behalf of their household.	• Economic intervention: Financial support to alleviate financial resource constraints • Property-level intervention: Mitigating actions such as installing mitigation measures • Community-based intervention: Support with relocation during reinstatement.	• Recovery and preparedness, focusing on considerations for relocation during reinstatement and support for installing mitigation measures to improve long-term mental health outcomes.	• Concept: Mental health deterioration • Measurement tool: Five-point Likert scale • Self-reported: Yes.	• Household income and relocation during reinstatement were the most predictive factors for mental health deterioration. • Depth of flooding was a significant factor, with shallower floods associated with less mental health deterioration. • Implementing mitigation measures reduced the incidence of severe mental health deterioration. • Financial resource constraints and relocation needs can lead to severe mental hardship.	• Limited to a single flood event in England • Focus on households with direct flood damage may lead to overestimation of distress • Cross-sectional study limits comparison with short-term impacts • Not representative of national socio-demographic patterns.	Relocation associated with mental health deterioration Mitigation measures linked to less severe mental health deterioration.

Reference	Country/ Region	Study design	Data source	Sample characteristics	Intervention type	Intervention point	Outcomes	Relevant Findings	Limitations	Key Points
(Lorenzoni *et al.*, 2024) Innovation in coastal governance: Management and expectations of the UK's first sandscaping scheme https://doi.org/10.1007/s10113-024-02248-x	East of England, North Norfolk	• Mixed methods approach • Qualitative methods: Interviews with stakeholders • Quantitative methods: Household survey • Cross-sectional design.	• Stakeholder interviews • Household questionnaire survey.	• Adult men and women aged 55 years or over (24.3% were 55-64 and 55.7% over 65) • 51% male, 47% female • Residents of Bacton and Walcott villages • Many had lived in the area for several years (17.1% 4-6 years, 15.7% 7-10 years, 14.3% 11-18 years, 32.9% 19 years or more, and 8.6% all their life) • Moved to the area for retirement (39%), amenities (19%), or family/friends (11%).	• Large-scale beach nourishment scheme, specifically the Sandscaping Scheme, which is a property-level environmental intervention. • involved the deposition of 1.8 million cubic meters of sand along a 5.7 km stretch of coast, with a predicted functional life of 15-20 years.	• Preventative measure related to flood preparedness, designed to protect the area from future erosion and flooding by nourishing the beach with sand.	• Primary outcome: Protection of the Terminal and villages from erosion and coastal flooding for 15-20 years. • Primary outcome: Functional life of the scheme lasting 15-20 years.	• Collaboration and good relationship named as key factors for successful outcomes. Assuaging anxiety, giving hope: • Most interviewees and residents foresaw significant benefits from the Scheme, including relief from anxiety related to flooding and erosion risks. Expectations of the Scheme: • The Scheme is seen as an innovative solution working with natural processes, providing temporary relief and buying time for future adaptation. • Tensions were expressed around uncertainty beyond the Scheme's lifetime and the need for future adaptation discussions. • The Scheme is intentionally impermanent and designed for low maintenance, with monitoring indicating it is performing as predicted.	• Small sample size (70 completed questionnaires) • Findings not generalizable to other locations.	Sandscaping scheme described to relieve anxiety and relief related to flooding risk

Reference	Country/ Region	Study design	Data source	Sample characteristics	Intervention type	Intervention point	Outcomes	Relevant Findings	Limitations	Key Points
(McLachlan and Waitoki, 2022) Collective action by Māori in response to flooding in the southern Rangitīkei region. https://doi.org/10.1080/14635240.2020.1843188	New Zealand; Southern Rangitīkei region, North Island	• Study design: Kaupapa Māori qualitative case study • Methods: Individual interviews, focus groups with thematic analysis.	• Primary data collection through individual interviews with 10 Indigenous community leaders and three focus groups with 22 health and social service practitioners, using snowball sampling for participant identification.	• 10 Indigenous community leaders • 22 health and social service practitioners • Māori community, specifically Ngā Wairiki-Ngāti Apa tribes.	• Community-based intervention: Use of tribal infrastructures as shelters, kitchens, and coordination hubs • Social intervention: Indigenous leadership models (rangatiratanga, manaakitanga), community committees for financial support.	Recovery phase	• Activation of Indigenous communities to engage in collective action through shared historical connections and aspirations for cultural regeneration. • Importance of understanding and implementing cultural knowledge and practices in disaster responses • Use of tribal infrastructures as shelters and coordination hubs for psycho-social responses. • Reliance on Indigenous leadership models of rangatiratanga, manaakitanga, and holistic concepts of wellbeing. • Collective response of Indigenous communities to disasters, emphasizing community cohesion and action.	Four key themes identified: collective aspirations, genealogical relationships, collective leadership, and Indigenous values. • Māori communities respond quicker to disasters than local governments. • Genealogical relationships are a key foundation for successful collaboration. • Māori cultural values are central to community responses and recovery. • Incorporating cultural knowledge and practices is crucial for effective disaster responses. • Indigenous communities can effectively respond to disasters by leveraging cultural strengths and values.	• The study's original goal was not focused specifically on collaboration within disaster responses, which might have limited the depth of exploration in this area.	Local (indigenous) Values important for Community response and recovery (i.e., Key to incorporate Cultural and local Knowledge) Making use of local and communal networks helps to effectively respond to flood on community-level.

Reference	Country/ Region	Study design	Data source	Sample characteristics	Intervention type	Intervention point	Outcomes	Relevant Findings	Limitations	Key Points
(Mulchandani *et al.*, 2019) Effect of insurance-related factors on the association between flooding and mental health outcomes. https://doi.org/10.3390/ijerph16071174	England	• Cross-sectional • Quantitative secondary analysis.	• English National Study of Flooding and Health (NSFH) two years following floods (December 2013–March 2014). N=1064 households.	• 18 years and over (no other demographics given). • Participants were categorized into flooded, disrupted, and unaffected groups based on their experience of flooding. • The majority of participants had household insurance prior to the flooding episode.	• Economic intervention: "Repair and Renew" scheme providing a £5000 grant for home improvements to increase flood resilience. • Insurance claims .	• Recovery phase of flooding, focusing on support services and insurance processes rather than prevention or acute response. The "Repair and Renew" scheme is an example of a recovery-focused intervention.	• Probable depression: measured by PHQ-2 (threshold ≥ 3) • Probable anxiety: measured by GAD-2 (threshold ≥ 3) • Probable PTSD: measured by PCL-6 (threshold ≥ 14).	• Not having household insurance significantly increased the odds of developing PTSD (OR 4.31, 95% CI 1.31-14.20) among those whose homes were flooded. • Severe stress due to insurance issues was associated with increased odds of depression (OR 11.08), anxiety (OR 4.48), and PTSD (OR 7.95). • Higher proportions of uninsured individuals were found among those with pre-existing illness (18.0% compared to 10.8% in those without pre-existing illness). • Higher proportions of uninsured individuals were found among those with lower education levels (no formal education: 21.9% uninsured; below degree: 9.9% uninsured; degree or above: 9.4% uninsured).	• Potential recall bias in self-reported stress measures. • Lack of explicit definition of "insurance-related issues" in the questionnaire. • Unaccounted confounders such as sufficient insurance coverage and social support. • Use of IMD scores as a proxy for socio-economic status due to lack of individual income data.	Not having household Insurance linked to significantly higher odds of developing PTSD Insurance issues linked To significantly higher odds of depression, Anxiety, and PTSD

Reference	Country/ Region	Study design	Data source	Sample characteristics	Intervention type	Intervention point	Outcomes	Relevant Findings	Limitations	Key Points
(Müller *et al*., 2024) Mindfulness meditation improves mental health in flood survivors and disaster volunteers: A randomized wait-list controlled trial. https://doi.org/10.1007/s12671-024-02467-7	Germany; Rhineland-Palatinate, specifically the Valley of the River Ahr	• Randomized controlled trial (RCT) • Longitudinal study • Quantitative study.	Primary data collection through participant questionnaires and recruitment via social media, email lists, personal approaches, and flyers.	• Sample size: 146 participants • Gender: 80.1% female, 19.2% male, 0.7% diverse • Age: Average 43.4 years, range 16-74 • Occupation: Majority employed (54.1%), followed by self-employed, retired, in college, civil servants, in training, and unemployed • Prior meditation experience: 57 participants had experience, 88 did not • Flood impact: Most directly affected or had family/friends affected; some volunteered in the disaster area.	• Intervention type: Digital mindfulness intervention • Frequency: 42 sessions over 6 weeks • Duration: Each session was 10-12 minutes long • Amount: Received by 74 participants initially, and later by the control group.	• Recovery phase of the flood disaster in Germany in July 2021, specifically from early December 2021 to mid-January 2022, as part of an acute response and recovery effort rather than a preventative measure.	• Self-compassion: Measured using the German short form of the Self-Compassion Scale (SCS-SF) • Life satisfaction: Measured using the short-scale Life Satisfaction (L-1) • Positive and negative affect: Measured using the Positive and Negative Affect Schedule (PANAS) • Perceived stress: Measured using the German version of the Perceived Stress Scale (PSS-10) • Pathological symptoms: Measured using the German short version of the Brief Symptom Inventory (BSI-18).	• The digital mindfulness intervention significantly improved self-compassion, life satisfaction, and positive affect while reducing negative affect, perceived stress, and pathological symptoms (all small to moderate effects; larger effects from time1 to time2 than from time2 to time3). • No deterioration was observed in the intervention group's mental health outcomes between T2 and T3. • The intervention's effects were maintained at follow-up for most variables, with some showing further improvement. • Mindfulness meditation was found to benefit both flood victims and disaster volunteers.	• The sample consisted primarily of people open to a meditation intervention and had some prior interest and possibly positive expectations of mindfulness programs. • Nearly 80% of the participants were female, which may limit generalizability. • Few participants in the 25-30 age range. • Unclear if participants' mental health problems were related to the flood. • The subject of the study was not concealed, potentially leading to biased responses. • No control for multiple testing, increasing the risk of type I error. • Dropout rates and differences in age and education between completers and non-completers. • Use of a single-item scale to measure life satisfaction. • The study was not blinded, potentially affecting interpretation.	Digital mindfulness intervention improved self-compassion, life satisfaction, positive affect; and reduced negative affect, perceived stress, and pathological symptoms.

Reference	Country/ Region	Study design	Data source	Sample characteristics	Intervention type	Intervention point	Outcomes	Relevant Findings	Limitations	Key Points
(Munro *et al*., 2017) Effect of evacuation and displacement on the association between flooding and mental health outcomes: A cross-sectional analysis of UK survey data. https://doi.org/10.1016/S2542-5196(17)30047-5	England; Gloucestershire, Wiltshire, Surrey, Somerset, Kent	• Cross-sectional • Quantitative.	The data source is the 2013-14 Public Health England National Study of Flooding and Health, which involved a cross-sectional survey of flood-affected areas in England.	• Adult men and women aged 18 and older • Predominantly female (59%) • Majority home owners (90%) • Affluent socio-economic group (76% from highest two quintiles) • Mostly from the south of England • Few participants from deprived areas or non-white ethnicities.	• The study is observational • Analysis compares people who received warning (less than 12 hours, 12+ hours warning) of the flood with those who did not receive any warning.	N/A	• Depression: Measured by PHQ-2 depression scale • Anxiety: Measured by GAD-2 anxiety scale • Post-traumatic stress disorder: Measured by PCL-6 scale All outcomes are self-reported and based on validated scales to screen for symptoms suggestive of probable mental disorders.	Displacement due to flooding was associated with higher scores for depression, anxiety, and post-traumatic stress disorder. • Odds ratios for displacement were 1.95 for depression, 1.66 for anxiety, and 1.70 for post-traumatic stress disorder. • No warning before flooding and displacement was associated with higher scores for depression and post-traumatic stress disorder. Among the displaced, the scores for depression and post-traumatic stress disorder were significantly higher when there was no or only short warning than when there was a warning of 12 h or longer (p=0·04 for depression, and p=0·01 for post-traumatic stress disorder from a test for trend.Y30- Severity of flooding was a potential confounder, but the increased risk of depression remained significant after adjustment.	• Limited representativeness of respondents due to affluent areas and under-representation of deprived and non-white participants • Potential underestimation due to missing responses from those displaced for over a year • Low response rate (23%) suggests potential bias • Point-prevalence data may not reflect long-term outcomes • Overreporting of symptoms due to recollection bias • Potential for residual confounding from unmeasured risk factors • Lack of specific information on previous mental health.	No pre-flood warning linked to higher depression, anxiety, and PTSD scores compared to warning received 12h prior or >12h prior -> Early warning important.

Reference	Country/ Region	Study design	Data source	Sample characteristics	Intervention type	Intervention point	Outcomes	Relevant Findings	Limitations	Key Points
(Osberghaus *et al.*, 2025) The intention-behavior gap in climate change adaptation: Evidence from longitudinal survey data. https://doi.org/10.1016/j.ecolecon.2025.108543	Germany	• Longitudinal panel survey • Quantitative.	The data source is the "Green SOEP" household panel survey, a primary data collection effort conducted by Forsa in Germany over three waves in 2012, 2014, and 2020, involving more than 5000 households.	• Slightly older and better educated than the average German population • Less single occupancy households • Age: 19-92 years • Gender: Female (30%) • Education: High education (Abitur or higher) (41%) • Household size: 1-5 persons • Income: Monthly household income in 1000 € (0.75-5.75) • Homeowner-ship: 63%.	• Property-level / preparedness Flood-proofing measures: • Behavioural: Moving valuable assets to higher floors • Technical: Installing sewer backflow preventers, water barriers in the basement, water-resistant indoor painting, water-resistant exterior painting, water-resistant flooring • Heat stress reduction measures: • Having a fan • Air-conditioning • Heat protection window films • Green roofs.	Preventative: assesses intentions and implementations of flood-proofing and heat stress reduction measures over time.	• Intention-behaviour gap (IBG) for flood-proofing and heat stress reduction measures • Life satisfaction (0-10) • Self-efficacy.	• The study reveals a substantial intention-behaviour gap (IBG) in climate change adaptation, with only 24.8% of flood intentions being implemented. Flood damage: lower life satisfaction (−0.16**) Implemented intentions without damage: lower life satisfaction (−0.63*). Implemented intentions with damage: higher life satisfaction (+1.05** interaction). Highest LS: implemented intentions + experienced damage. Lowest LS: implemented intentions + no damage.	• Limited opportunities to investigate short-term reactions due to time gaps between survey waves • Use of binary measures for planned behaviour may not capture full complexity.	Implemented flood property measures linked to higher life satisfaction for those who experienced flood damage; but lower life satisfaction for individuals without flood damage.

Reference	Country/ Region	Study design	Data source	Sample characteristics	Intervention type	Intervention point	Outcomes	Relevant Findings	Limitations	Key Points
(Raguenaud *et al.*, 2012) Epidemiological surveillance linked to an outreach psychological support program after the Xynthia storm in Charente-maritime, France, 2010. https://doi.org/10.1017/S1049023X12001082	France; Charente-Maritime and Vendee	Longitudinal, Quantitative, Surveillance study.	Primary data collection through individual record sheets completed by health providers for each person showing psychological manifestations related to the Xynthia storm.	• People who displayed (to healthcare practitioners) psychological manifestations directly or indirectly linked with the storm • Predominantly female (70%) • Mainly adults over 60 years of age (48%) • Majority did not have a past history of psychiatric illness (80%).	• Intervention type: Community-based psychological support services • Description: Psychological telephone counselling and initial psychological counselling provided by psychologists trained in post-traumatic disorders • Frequency and duration: Active for six months; high attendance during the first two months.	Outreach programme to surveille and manage help to people impacted psychologically after storm/ flooding. The intervention was administered during the post-emergency phase, specifically as part of the recovery efforts following the Xynthia storm. It was not preventative or part of the acute response phase.	• Primary psychological symptoms: depressive signs (43%), signs of anxiety (39%), signs of PTSD (20%) • Need for medical follow-up: nearly all cases required follow-up • Referrals: 71% referred to a GP, 16% required specialized care by a psychologist or psychiatrist.	The surveillance program effectively monitored mental health service use and provided guidance to health authorities. New cases were mainly female adults, with one fifth having a past history of psychiatric illness. • The majority of cases were women (70%), with nearly half being adults over 60 years old. • The most frequent psychological symptoms were depressive signs (43%), anxiety (39%), and PTSD (20%). • Over one third of cases had multiple mental health outcomes. • - Most cases were referred to a GP for follow-up, with some requiring specialized care. • - Outreach services had high attendance initially but declined over time.	• GPs did not participate in the surveillance, limiting representativeness. • Reluctance of GPs to participate due to flooded offices and lack of briefing. • Exhaustiveness of case reporting was not measured. • Data not representative of all health providers and total population. • Only initial consultations were recorded, not total workload.	Outreach program with high initial take-up; helped effectively refer flooded individuals to GPs or specialised care.

Reference	Country/ Region	Study design	Data source	Sample characteristics	Intervention type	Intervention point	Outcomes	Relevant Findings	Limitations	Key Points
(Schernewski *et al.*, 2018) A combined coastal protection, realignment and wetland restoration scheme in the southern baltic: Planning process, public information and participation. https://doi.org/10.1007/s11852-017-0542-4	Germany; Rostock, Mecklenburg-Vorpommern	• Cross-sectional case study • Mixed methods (quantitative surveys and qualitative interviews).	• Primary data collection: Two surveys (beach visitor survey and inhabitant/ visitor survey), expert interviews • Secondary data sources: Literature review, media review • Administrative data sources: Existing documents and records from the State Authority for Agriculture and Environment.	• Majority female (64%) • Age groups: 40-49 years (25%), 30-39 years (20%), 20-29 years (16%), 50-59 years and 60+ years (15%) • Majority tourists (60%) • 20% lived in Mecklenburg-Vorpommern • 90% had visited the German Baltic Sea previously • About a third held a university degree • Majority felt safe regarding storm surges (91%) • Local inhabitants: 79% aged between 41 and 67 years • 49% of local inhabitants older than 55 and most retired.	• Coastal protection and realignment scheme • Components: • Ring-dyke, groyne rows, dune nourishment • Realignment and restoration of Hütelmoor: abandonment of coastal protection measures, removal of pumping station, installation of ground sill, changes to walking paths • Duration: 14 years (1991-2006 for coastal protection; 2006-2012 for Hütelmoor restoration).	• Preventative, aiming to protect against future flooding and erosion due to sea level rise and coastal erosion.	• Public perception of coastal changes and climate change • Satisfaction with the measure (dune belt).	• Local residents and tourists did not associate coastal changes with climate change (less than 10%). • 81% felt insufficiently informed about the coastal protection and wetland restoration measures; 89% would like to learn more. • Traditional information strategies were insufficient; new collaborative strategies are needed (still most received information through local press) • After implementation of the ring-dyke, 91% of residents felt very safe or safe with respect to storm surges. • 66% had previously experienced a storm flood.	• The study focuses on a specific case study, which might limit its generalizability to other contexts. • The traditional information and public participation process was deemed insufficient. • The lack of comprehensive success criteria and indicators to measure success highlighted as a weakness.	After implementing ring dyke, 91% of residents felt safe or very safe from future storm surges.

Reference	Country/ Region	Study design	Data source	Sample characteristics	Intervention type	Intervention point	Outcomes	Relevant Findings	Limitations	Key Points
(Sugiyama *et al.,* 2020) School-Based intervention program based on cognitive behavioral therapy for Japanese students affected by the Hiroshima heavy rain disaster of July 2018. https://doi.org/10.1111/jpr.12282	Japan, Hiroshima prefecture	• Quantitative • Longitudinal • Intervention study with pre-post design • No control group.	Primary data collection from 229 second-grade senior school students using standardized questionnaires before and after the intervention.	• Second-grade senior school students • 136 males, 93 females • Affected by the Hiroshima heavy rain disaster • No prior psychotherapy experience or drug treatment.	• Intervention type: Group Cognitive Behavioural Therapy (CBT) • Frequency: Single session • Duration: 50 minutes • Amount: Conducted simultaneously with all students.	• Recovery phase, focused on addressing post-disaster psychological impacts.	• Reduction in depression scores measured by the Center for Epidemiologic Studies Depression Scale (CES-D) • Increase in resilience scores measured by the Tachikawa Resilience Scale (TRS).	• The intervention significantly reduced depression scores in the high-depression group (effect size moderate (d = 0.46)); no significant difference between pre- and post-intervention in the low-depression group. • Resilience scores increased in both high- (d = −0.26) and low-depression groups (d = −0.40). • The low-depression group showed higher resilience scores than the high-depression group. • There was a negative correlation between resilience and depression scores (high-depression group ($r = -.43$, $p < .001$), low-depression group ($r = -.36$, $p < .01$)).	• Lack of a control group • Inability to compare effects on PTSD symptoms • Intervention was conducted in only one session, which may not have been sufficient.	Group CBT significantly reduced depression scores for high-depression adolescents (not for low-depression group) Group CBT increased resilience in both groups.

Reference	Country/ Region	Study design	Data source	Sample characteristics	Intervention type	Intervention point	Outcomes	Relevant Findings	Limitations	Key Points
(Sundareswaran *et al.*, 2015) Upstream disaster management to support people experiencing homelessness. https://doi.org/10.1371/currents.dis.95f6b76789ce910bae08b6dc1f252c7d	Canada	Qualitative study using interviews and thematic analysis.	Primary data: telephone interviews with key informants (n=21) from a larger sample of 43 interviews focused on programs and supports for people at heightened risk during disasters.	(n=4) volunteers and (n=13) professionals in disaster management, and (n=4) professionals in social services, from across Canada.	• Social intervention: Upstream continuity planning, collaboration, and communication between emergency management and community service organizations. • Health intervention: Prioritization and investment in social determinants of health and community supports. • Economic intervention: Financial support for community programs focusing on prevention and transition out of homelessness (e.g., housing programs and counselling). • Community-based intervention: Collaboration between emergency managers and community level organizations.	• Preventative, focusing on upstream continuity planning, collaboration, and addressing social determinants of health to enhance resilience and preparedness among homeless populations.	• Enhancement of upstream continuity planning, collaboration, and communication between emergency management and community service organizations. • Recognition and utilization of community support organizations as assets in disaster preparedness. • Identification of homeless populations and recognition of functional capabilities and limitations. • Reduction of marginalization. • Importance of continuity planning and accessibility of informational resources. • Inter-organizational collaboration to enhance community capacity. • Prioritization of upstream investments in continuity planning and addressing social determinants of health.	• The study indicates a need for more upstream continuity planning, collaboration, and communication between emergency management and community service organizations. • Prioritization and investment in social determinants of health are necessary to promote resilience among homeless populations. • Community support organizations are often overlooked in disaster planning, highlighting a critical gap. • Lack of resources is a significant barrier to supporting homeless populations. • Inter-organizational collaboration and prioritization of homeless populations in disaster planning are key areas for improvement. • Preparedness is influenced by social determinants of health such as income and housing insecurity. • Collaboration between emergency managers and community organizations is essential for enhancing resilience. • Factors like addiction, lack of access to information, and transiency increase risk during disasters.	• Limited empirical literature on disaster preparedness for homeless populations • Homeless populations are often overlooked in disaster planning • Lack of resources is a barrier to sustainability and support • Disaster preparedness is not a priority for those facing daily basic needs challenges • Limitations in governmental support and funding schemes.	Collaboration between emergency management and community organisations is key for enhancing resilience in deprived individuals/ communities.

Reference	Country/ Region	Study design	Data source	Sample characteristics	Intervention type	Intervention point	Outcomes	Relevant Findings	Limitations	Key Points
(Turnpenny and Alexander, 2024) Addressing risks to mental health from climate change: A policy capacity analysis of England. https://doi.org/10.1080/14693062.2024.2362848	England	• Case study • Qualitative • Semi-structured interviews • Policy document analysis • Thematic analysis.	• Primary data: Semi-structured interviews with stakeholders across policy areas. • Secondary data: Analysis of legislation, policy documents, reports, guidance, position statements, and organizational websites.	Interviewees included NHS representatives, academic experts, medical professionals, national government representatives, third sector representatives, representatives from non-departmental public body, and natural environment.	• Health interventions: Therapies including counselling and nature therapy (e.g., 'green prescribing') • Community-based interventions: Community building, including community involvement in planning and support • Educational interventions: Education and training for health and other professionals, public education on climate change impacts and responses, research and networks to support education, knowledge exchange and policy-making.	Not one intervention, but various possible actions are discussed.	NA - exploratory.	• The study finds strengths in analytical and political capacity in England's policy systems for addressing mental health risks related to climate change (incl. long-standing charity programs, data gathering and analyses by, e.g., Natural England – an executive non-departmental public body, sponsored by the UK Department for Environment, Food and Rural Affairs (Defra). • Significant weaknesses in operational capacity hinder coordinated and preventative adaptation efforts (e.g., higher demand for NHS Mental Health Services than budgets are being allocated for it). • The paper emphasizes the importance of understanding policy capacity dynamics and feedback loops between different types of capacities (e.g., need for better communication between organisations and systems is mentioned, so not everyone assumes that another entity will work on climate change-related mental health). • Remaining gaps in policy capacity need to be addressed to effectively adapt to mental health risks posed by climate change.	• Focus on the systemic level might limit depth in other areas. • Data collection as part of a larger project could limit scope or depth.	Mental health outcomes not empirically measured but discussed: helpful interventions could include charity programs, NHS Mental Health Services But more funding needed for those and more of a collaboration with policymakers.

Reference	Country/ Region	Study design	Data source	Sample characteristics	Intervention type	Intervention point	Outcomes	Relevant Findings	Limitations	Key Points
(Walker-Springett *et al.*, 2017) Wellbeing in the aftermath of floods. https://doi.org/10.1016/j.healthplace.2016.11.005	England: Somerset Levels and Moors, Boston, Lincolnshire	• Mixed methods • Qualitative (longitudinal) • Quantitative (cross-sectional).	• Qualitative data: Repeated semi-structured interviews with 60 individuals affected by flooding in Somerset (six to eight months after flood waters receded) and (twelve to fourteen months after flood waters receded. • Quantitative data: Cross-sectional telephone survey of 1000 individuals affected by (quota sample).	• Qualitative interview participants: approximately even gender split, two-thirds aged 64 or over, mostly retired • Survey respondents: just over half female, most common age range 45-54 years, 30% retirees, mostly employed or own/privately rent homes • Median age in Somerset: 44 years, fewer young adults, more older adults • Median age in Boston: 42 years, increase in young adults, stable older adults • Ethnicity in Boston: 65% White British • Ethnicity in Somerset: 95% White British.	Community support (range of initiatives including 'Keep in Touch' scheme for those who were evacuated).	Acute response and recovery after extreme rainfall during winter 2013/14.	Wellbeing outcomes, measured using a self-reported scale of 0 to 10 based on the Centre for Disease Control definition, with a focus on the non-linear trajectory of wellbeing over time and influenced by factors such as institutional responses, community relations, and perceptions of future insecurity.	• The study reveals diverse pathways to wellbeing outcomes after floods, emphasizing the intersection of various factors. Social resilience, networks and community: • Recovery follows a non-linear trajectory, with community networks and relationships crucial for mitigating negative impacts. Agency, power, and perceptions: • Perceived lack of agency has negative consequences for wellbeing, while community connections have positive effects. Sense-making, ruptured futures, and wellbeing: • Negative wellbeing outcomes are associated with perceptions of ruptured futures and insecurity about future floods.	• The study's focus on an 18-month period post-flood may not capture all changes in wellbeing. • Retrospective surveys may introduce bias. • Did not analyse multiple flood events.	Community networks and relationships crucial for mitigating negative mental health impacts Perceived lack of agency (as community and individuals) linked to negative wellbeing outcomes.

Reference	Country/ Region	Study design	Data source	Sample characteristics	Intervention type	Intervention point	Outcomes	Relevant Findings	Limitations	Key Points
(Walkling and Haworth, 2020) Flood risk perceptions and coping capacities among the retired population, with implications for risk communication: A study of residents in a North Wales coastal town, UK. https://doi.org/10.1016/j.ijdrr.2020.101793	North Wales, Rhyl	Qualitative study design; In-depth interviews; Purposive sampling method; Semi-structured interviews; Thematic content analysis.	Primary data collection through in-depth interviews with 12 members of the retired population in a flood risk area of north Wales, UK, using semi-structured interviews conducted in June 2018.	• Adult men and women aged 65-88 • Majority female (9 out of 12) • Majority members of a local church • Not in full-time employment • Varied experience with flooding (direct, indirect, none).	Community-based (various risk communication methods, e.g., phone calls).	• Preventative: focused on understanding and improving risk communication and preparedness among retired individuals in a flood risk area. • Aiming to inform more age-centred approaches for flood preparedness rather than being part of an acute response or recovery phase.	• Risk perceptions of flooding • Coping capacities • Risk communication preferences.	Qualitative themes: 1. Challenges faced by older population: Relying on others (importance of access to transport/ vehicle; reliance makes evacuation less efficient); Poor health; Temporality (continuous changes in experiences/ life reality) 2. Risk perception in retired population: Low personal risk perception (low personal concern for flooding; felt personally secure; but awareness for potential local vulnerability in general) 3. Coping capacities among retired population: shared community support (e.g., volunteering in some formal or informal way); social activities to reduce isolation -> especially volunteering had positive impacts on wellbeing 4. Risk communication: Flood response/ evacuation (many unaware of evacuation procedures and destinations; clearer communication needed to reduce uncertainty); Preparedness and preparedness information (lack of personal preparedness due to low risk perception; information disregarded as junk mail; many didn't receive information due to lack of access to modern distribution (e.g., social media alerts); Age-centred flood risk communication (communication should leave sufficient time before flood (takes older population longer to prepare/ mobilise); communication should indicate expected magnitude of flood).	• Small sample size • Limited study area • Bias due to recruitment method (majority of participants were church members) • Findings may not generalize to wider at-risk retired population.	Shared community support and engaging In social activities described to reduce Isolation and have positive impact on wellbeing Clearer evacuation and risk communication would reduce uncertainty Age-centred and early rRisk communication to allow timely evacuation and preparedness

Reference	Country/ Region	Study design	Data source	Sample characteristics	Intervention type	Intervention point	Outcomes	Relevant Findings	Limitations	Key Points
Mehring *et al*. (2023). The F word: The experiential construction of flooding in England. 100966. https://doi.org/10.1016/j.emospa.2023.100966	England	Qualitative study: interviews with 20 homeowners who have experienced flooding, with a focus on those who have flooded on two or more occasions.	Primary data collection using qualitative interviews with 20 homeowners who had experienced flooding.	Sample Size: 20 Demographics: Over half retired, some very elderly, limited mobility/ disability Previous Flood Exposure: 14 out of 20 participants flooded on 2 or more occasions.	Flood warnings.	Preparedness (acute flood warning).	Short-term and longer-term mental wellbeing impacts of living in previously flooded homes/area.	Qualitative themes: 1. Living on a knife-edge: living with stress, fear, and uncertainty since flooding, 2. The fear of rain: experiencing fear and anxiety to be flooded again in rainy weather or when MetOffice issues weather warnings 3. Flood preparedness: fear of flooding again leads to avoidance of news, weather warnings, and avoidance of preparing home for potential future flooding 4. The arduous recovery process: feeling stranger in own home due to damage or changes after rebuilding; difficulty with insurance claims led to more uncertainty and fear 5. The fear of leaving your home alone: feel need to constantly check on home/ not leave in case of another flooding 6. The F word: Mention of “flooding” brings back difficult emotions; need for control 7. Home unmade or remade: having to remake home after flooding accompanied by cycle of stress with continued distress from preparing to managing and rebuilding 8. Feeling at home: flooding changed the way participants felt in their home; some thought about moving.	• Reliance on self-reported experiences and perceptions may be subject to recall bias or social desirability bias. • The study’s focus on emotional impacts and qualitative experiences might not fully capture the broader socio-economic or environmental factors affecting flood communities.	Weather warnings and flood warnings can help to prepare for flooding, but they can also elicit anxiety and fear every time it rains.

Reference	Country/ Region	Study design	Data source	Sample characteristics	Intervention type	Intervention point	Outcomes	Relevant Findings	Limitations	Key Points
Klör *et al*. (2025). Factors influencing mental burden caused by flooding: Insights from the 2021 flood in the Ahr Valley (Germany) https://doi.org/10.1111/jfr3.70116	Ahr Valley, Rhineland-Palatinate, Germany	Survey study; cross-sectional; Approximately 18 months after the flood event.	Primary data collection using postal household surveys.	• 277 individuals over 18 years of age and have received emergency financial relief after flood • Most respondents aged 20-64 years, 55.6% male.	Acute recovery and response (e.g., evacuation; financial and psychological emergency aid).	Acute recovery and response (studied 18 months after flood).	Overall mental burden (mental preoccupation, avoidance, wishful thinking, perceived consequences of future floods, perceived response efficacy of precautions taken, perceived protection level).	• 42.6% of respondents reported high levels of mental burden even 1.5 years after the event • Contributors to mental burden were heightened perception of future flood risks, reduced confidence in precautionary measures, and poor self-reported health • Lower satisfaction with recovery process (incl. financial aid or insurance payouts) linked to higher mental burden – inverse link for high satisfaction with recovery process; many perceived reconstruction process to be too slow • Those with insurance coverage were more satisfied with recovery process than those without.	• The sample only included households directly affected by the flood, excluding unaffected households or those without damage. • Mental burden was assessed solely through self-reported survey responses, which may not capture external influences on mental states.	• Extreme flood events can have lasting psychological consequences • Psycho-social support (including short- and long-term) should be a fundamental component of disaster response strategies • Financial aid and insurance coverage important to alleviate mental burden through recovery process.
Paranjothy *et al*. (2011). Psychosocial impact of the summer 2007 floods in England. https://doi.org/10.1186/1471-2458-11-145	South Yorkshire and Worcestershire, England	Cross-sectional survey study and interviews (3 and 6 months after flood).	Primary data collection through postal surveys and follow-up interviews.	• Mean age 50 years (South Yorkshire), 57 years (Worcestershire); Higher proportion of females (72% in South Yorkshire, 57% in Worcestershire) • Socioeconomic Status: Higher proportion of unemployed and retired individuals • Pre-existing Mental Health Conditions: Adjusted for self-reported history of health problems.	Disruptions to essential services and evacuation measures.	Acute recovery and response.	Psychosocial impact was assessed by psychological distress, probable generalised anxiety, probable depression, and probable post traumatic stress disorder.	• Disruptions to essential services linked to higher psychological distress, but not anxiety, depression, or PTSD • Water ingress in home linked to psychological distress, anxiety, depression, and PTSD.	• Low response rates may lead to biased results. • Cross-sectional design limits understanding of pre-flood mental health impact. • Lack of data on individual social class. • Study sample demographics differ from general population.	• Smooth and timely evacuations with continued access to essential services is important to not augment psychological distress.

Reference	Country/ Region	Study design	Data source	Sample characteristics	Intervention type	Intervention point	Outcomes	Relevant Findings	Limitations	Key Points
Hudson *et al.* (2019). Impacts of flooding and flood preparedness on subjective well-being: A monetisation of the tangible and intangible impacts. https://doi.org/10.1007/s10902-017-9916-4	France (the Var, West, and the Ardennes)	Cross-sectional household survey study.	Primary data collection using a household survey.	• Approximately 900 flood-prone households • Demographics: Representative of the French population; household income elicited via categorical classes • About 70% of the sample has been flooded before; 41% experienced a flood within the previous 12 months.	Property-level flood proofing measures (e.g., raising house or dry flood-proofing).	Flood preparedness.	Subjective wellbeing regarding overall, health, with home, living environment, financial situation, amount and use of free time, family life, social life.	• Satisfaction with living environment and social life were most powerful predictors of subjective wellbeing • Elevating home linked to significantly better subjective wellbeing • Dry- and wet-flood proofing measures had no significant impact on wellbeing.	• The final dataset used for analysis may not be fully representative due to missing observations. • The backward-looking nature of the survey could lead to inaccuracies due to respondents' memories of past flood experiences.	• Raising property is effective in reducing household flood risk and significantly increased subjective wellbeing • Other property flood proofing measures had no impact on wellbeing.
Wind *et al.* (2011). Social capital and post-disaster mental health. https://doi.org/10.3402%2Fgha.v4i0.6351	Morpeth, Northumberland County, UK	Cross-sectional community survey study with face-to-face interviews.	Primary data collection using survey and follow-up face-to-face interviews.	• Sample Size: 232 • Demographics: Predominantly female (60.8%), aged population (57.4% >65 years).	Community-level intervention (social support).	Acute recovery and response phase.	Anxiety, depression, PTSD, coping intensity, primary and secondary appraisal.	• Coping intensity significantly linked to higher anxiety, depression, and PTSD • Social support significantly negatively linked to anxiety and depression, but no link with PTSD • Displacement had no significant impact on mental health outcomes • Property loss significantly linked to poorer mental health outcomes (for anxiety, depression, and PTSD).	• The cross-sectional design does not allow for the establishment of causal relationships between social capital and disaster mental health. • The high non-response rate due to refusal and absence may result in a biased sample.	Social support seems to be a significant buffer that protects mental health against adverse outcomes after floods, including after property loss.

Appendix 1.3 (Workstream 1): Table summarising the quality of the 28 included studies

Table summarising the quality of the 28 included studies.								
		Screening questions		1. Qualitative studies	2. Randomized	3. Non-randomized	4. Quantitative	5. Mixed methods studies
First author	Year	S1. Are there clear research questions?	S2. Do the collected data allow to address the research questions?	1.1. Is the qualitative approach appropriate to answer the research questions?	2.1. Is randomization appropriately performed?	3.1. Are the participants representative of the target population?	4.1. Is the sampling strategy relevant to address the research questions?	5.1. Is there an adequate rationale for using a mixed methods design?
1. Dootson *et al.*	2023	Yes	Yes	Yes		Yes		Yes
2. Schernewski *et al.*	2018	Can't tell	Yes	Yes		No		
3. Walker-Springet	2017	Yes	Yes	Yes		Can't tell		Yes
4. Osberghaus *et al.*	*2025*	Yes	Yes			Can't tell	Yes	
5. Harries	2012	Yes	Yes			No	Yes	
6. Lamond *et al.*	2015	Yes	Yes			Can't tell	Yes	
7. Bokszczanin	2012	Yes	Yes			Can't tell	Yes	
8. Butler *et al.*	2018	No	Yes	Yes		No		
9. Garde-Hansen *et al.*	2017	Yes	Yes	Yes		Can't tell		
10. Mulchandani *et al.*	2019	Yes	Yes			Can't tell	Yes	
11. McLachlan *et al.*	2022	No	Can't tell	Yes		Can't tell		
12. Turnpenny	2024	Yes	Yes	Yes		Can't tell		
13. Walkling	2020	Yes	Yes	Yes		Can't tell		
14. Kaniasty	2012	Yes	Yes	Yes		No		Yes
15. Andrews	2022	Yes	Yes	Yes		Can't tell		Yes
16. Bazart *et al.*	2020	Yes	Yes			No	Yes	
17. Sugiyama *et al.*	2020	Yes	Yes			Can't tell	Yes	
18. Sundareswaran	2015	Yes	Yes	Yes		Can't tell		
19. Carroll *et al.*	2010	Yes	Yes	Yes		Can't tell		
20. Müller *et al.*	2024	Yes	Yes		Yes	No	Yes	
21. Lorenzoni *et al.*	2024	Yes	Yes			Can't tell	Yes	Can't tell
22. Raguenaud *et al.*	2012	Yes	Yes			Can't tell	Yes	
23. Munro *et al.*	2017	No	Can't tell			No	Yes	
24. Hudson *et al.*	2019	Can't tell	Yes			Can't tell	Yes	
25. Klör *et al.*	2025	Yes	Yes			Can't tell	Yes	
26. Mehring *et al.*	2023	Yes	Yes	Yes		Can't tell		
27. Paranjothy *et al.*	2011	Yes	Yes			Yes	Yes	
28. Wind *et al.*	2011	Yes	Yes			Can't tell	Yes	

GREEN = up to 1 missing QA criterium; YELLOW = 2 missing QA criteria; RED = more than 2 missing QA criteria

Appendix 2.1 (Workstream 2): Details of the included case studies

1.Governance & System-Level Interventions

1A. Case Study Summary: National Disaster Mental Health and Wellbeing Framework, Australia (Australian Government, 2023; Australian Government Department of Health and Aged Care, 2023)

Primary intervention type – National policy and system-coordination framework for disaster mental health

Overview: Australia's National Disaster Mental Health and Wellbeing Framework provides consistent, national guidance on how governments, emergency agencies and recovery partners support mental health and wellbeing before, during and after disasters, including floods. Developed jointly by the National Mental Health Commission and the National Emergency Management Agency (NEMA), the framework adopts a whole-of-government and whole-of-system approach, informed by lived and living experience and implemented collaboratively across federal, state and territory levels. The framework is supported by targeted investment in workforce support, community outreach, digital coordination platforms and evidence-based delivery partners. This approach demonstrates a cross-sector, population-level mental health intervention, whereby national coordination improves consistency and equity; mental health support must span preparedness, response and recovery; workforce wellbeing is essential to system resilience; community-led and place-based approaches improve uptake, and digital coordination platforms reduce confusion post-disaster. Australia's National Disaster Mental Health and Wellbeing Framework demonstrates the value of a nationally coordinated, whole-of-government approach that integrates **prevention, preparedness, response and recovery** to mitigate the mental health impacts of flooding and other disasters. Governance features a whole-of-government approach with defined roles and responsibilities. The primary intended target population are disaster-affected communities, which includes flood-affected communities. Secondary target populations are emergency service workers and volunteers, children and young people, and rural, remote and repeatedly disaster-affected communities. Examples of National-level mechanisms include the Black Dog Institute's National Emergency Workers Support Service providing counselling, peer support and specialist mental health care; State-level mechanisms such as Queensland TRIAC providing outreach-based integrated care for disaster-affected regions; and Community-level mechanisms such as Recovery Connect, which is a centralised, trusted information and referral platform.

1B. Case Study Summary: Health in All Policies and Flood Adaptation, Ireland (Healthy Ireland, 2021; Healthy Ireland and Department of Health, 2019; Pyper *et al*., 2021)

Primary intervention type – Cross-government policy integration framework (Health in All Policies)

Overview: Ireland's Health in All Policies (HiAP) approach embeds health considerations across government decision-making, including climate mitigation, **adaptation** and flood risk management. Led by Healthy Ireland, the approach uses established interdepartmental and local authority partnerships to ensure health and wellbeing outcomes – both physical and mental – are considered within housing, energy, environment, spatial planning and infrastructure policy. Flood risk management is coordinated nationally by the Office of Public Works (OPW) through a whole-of-government model that explicitly recognises cascading cross-sectoral impacts on health, infrastructure and communities. This approach demonstrates that upstream action reduces downstream health impacts, including mental health stressors; flood risk management must be integrated with housing, water and planning policy; health co-benefits strengthen the case for climate adaptation investment; and strong national coordination enables local delivery without fragmentation. Governance features include a whole-of-government coordination, interdepartmental working groups, and local authority delivery embedded within national policy. The primary intended target populations are the general population, so population-wide health protection. However, there are priority groups, such as adults aged 55+, people with chronic respiratory conditions, low-income households experiencing fuel poverty, communities exposed to flood risk and service users affected by infrastructure disruption.

1C. Case Study Summary: Flood Risk Management, Finland (Ministry of Agriculture and Forestry, 2014)

Primary intervention type - Integrated, anticipatory flood risk governance centred on prevention, early warning, and coordinated land-use planning

Overview: Finland's approach to flood risk management demonstrates a coordinated, multi-level system that links environmental regulation, land-use planning, emergency **preparedness**, and insurance with the aim of reducing both physical and psychosocial harm from flooding. National government identifies significant flood risk areas and requires integrated Flood Risk Management Plans that bring together water management, spatial planning, rescue services, and environmental protection under shared governance structures. These plans combine early warning through the national Flood Centre, participatory local engagement, and preventative land-use controls to avoid creating new risk in vulnerable areas, while prioritising the protection of homes and critical services. By emphasising predictability, preparedness, clear roles, and reliable compensation through insurance, the system reduces uncertainty, anxiety, and prolonged disruption after floods—key drivers of poor mental health—while fostering public trust in institutions and collective resilience.

1D. Case Study Summary: Denmark (Baykal, 2012)

Primary Intervention type – Community co-designed, multifunctional green/blue flood infrastructure as a wellbeing-led urban adaptation strategy

Overview: Denmark illustrates a deliberately joined-up approach in which flood risk management is treated simultaneously as urban regeneration, housing policy and public health infrastructure. Municipalities integrate flood protection with place-making – such as co-designed floodable parks, green corridors and retention areas – so that **adaptation** projects must demonstrate clear social and wellbeing value, not just hydraulic performance. Because communities are actively involved in designing these multifunctional spaces, flood infrastructure becomes visible, predictable and socially useful, which builds trust, local ownership and cohesion. This combination of participatory planning, everyday green spaces and safer urban design reduces fear of flooding, strengthens social networks, and helps communities cope better before, during and after flood events.

2. Planning & Prevention Interventions

2A. Case Study Summary: Netherlands (Ministry of Infrastructure and Water Management, 2023; Ministry of Infrastructure and Water Management, the Ministry of Agriculture, Nature and Food Quality, and the Ministry of the Interior and Kingdom Relation, 2024)

Primary intervention type – Integrated, place-based flood adaptation through multifunctional green–blue infrastructure with community co-design

Overview: The Netherlands' integrated approach shows how flood management, spatial planning and public health can be deliberately aligned to reduce the psychological as well as physical harms of flooding. Through programmes such as *Room for the River*, water authorities, planners and municipalities co-design flood **adaptation** with communities, reshaping rivers, floodplains and urban spaces in ways that both lower risk and create accessible green–blue environments that support everyday wellbeing. Early and sustained public participation reduces fear and loss of control by giving residents agency in long-term adaptation, while visible, multifunctional defences strengthen feelings of safety and place attachment. After flood events, **recovery** planning explicitly links water management with health services so that psychosocial support is coordinated alongside physical rebuilding – treating "chronic flood stress" as a legitimate public health concern rather than a by-product of engineering decisions.

2B. Case Study Summary: Norway (Norwegian Ministry of Climate and Environment, 2025)

Primary intervention type – Statutory, local-government–led integration of public health (including mental wellbeing) into climate and flood risk planning and preparedness

Overview: Norway demonstrates how climate adaptation, land-use planning and public health can be structurally aligned at the municipal level to reduce the mental health impacts of flooding. National planning law requires local authorities to assess climate risks and health impacts together, embedding mental wellbeing within flood and **adaptation** strategies rather than treating it as an afterthought. Municipal flood preparedness plans deliberately coordinate emergency services, primary healthcare, and social services so that practical response, housing support and psychosocial care operate as a single system before, during and after flood events. In recovery, local

governments prioritise the preservation of social networks and community continuity – particularly in small rural and coastal settlements – while public health teams are trained to identify and respond to flood-related stress, anxiety, displacement trauma and social isolation, especially among older residents.

3.Structural & Environmental Interventions

3A. Case Study Summary: Copenhagen Cloudburst Management Plan, Østerbro, Denmark (Baykal, 2012)

Primary intervention type – Nature-based flood risk management and urban climate adaptation

Overview: Copenhagen's Cloudburst Management Plan is a city-wide climate adaptation strategy designed to reduce flood risk from extreme rainfall while delivering wider social, health and wellbeing benefits. Developed following a devastating cloudburst in 2011, the plan prioritises green and blue infrastructure over large-scale grey sewer expansion. The Østerbro Climate Quarter serves as a flagship district-scale implementation, integrating green streets, parks and public spaces that manage floodwater while improving urban liveability, community wellbeing and quality of life. Governance infrastructure features a joint public–utility financing model (lead bodies are the City of Copenhagen and Greater Copenhagen Utility Company with partners including Environmental Center Østerbro; Danish Transport, Construction and Housing Agency; private landowners and developers; and architecture and engineering firms); a long-term city-wide strategy (20-year horizon); annual prioritisation of projects; and a strong community co-design and engagement. The primary intended target population are urban residents in flood-prone areas, and secondary target populations are commuters, visitors, local businesses and vulnerable populations affected by flood risk.

3B. Case Study Summary: Flood Risk & Mental Wellbeing Project, Kirklees, West Yorkshire, UK (van Leeuwen *et al.*, 2022)

Primary intervention type – Integrated Natural Flood Management and public mental health intervention

Overview: The Kirklees Flood Risk and Mental Wellbeing Project, delivered through the West Yorkshire Flood Innovation Programme (WYFLIP), is a UK pilot that explicitly integrates Natural Flood Management (NFM) **adaptation** with public mental health and community wellbeing objectives. The project moves beyond traditional flood defence by using nature-based flood interventions as a mechanism to reduce flood risk while simultaneously addressing key psychological stressors associated with flooding, including anxiety, loss of control and social isolation. Governance features cross-sector collaboration (flood management, health, community), local authority leadership, a pilot-based innovation model and alignment with public health priorities. Delivery partners include Kirklees Council, Environment Agency, Public Health teams and community organisations and residents. The primary intended target population are flood-affected and flood-risk communities in Kirklees. Secondary target populations include residents experiencing stress or anxiety linked to flood risk, people at risk of social isolation and active community groups and volunteers.

3C. Case Study Summary: Liverpool City Green Infrastructure Strategy, UK (European Commission and the European Environment Agency (EEA), 2025c)

Primary intervention type – City-wide Nature-based Solutions and green infrastructure strategy

Overview: Liverpool has implemented a city-wide, Nature-based Solutions (NbS)-led climate resilience and **adaptation** strategy to address increasing flood risk, heat stress and environmental degradation associated with climate change and urban densification. Guided by the Liverpool City Green Infrastructure Strategy and supported by the EU Urban GreenUP programme, the city delivered more than 40 interconnected NbS interventions across neighbourhoods. These combine green infrastructure, sustainable drainage, biodiversity enhancement and community engagement to reduce flood risk, improve public health and strengthen urban liveability. Governance features Liverpool City Council collaborating with research institutions, private sector partners, EU Urban GreenUP programme and community and civic groups. The primary intended target population are urban residents in flood and heat-vulnerable areas and communities experiencing poor access to quality green spaces.

3D. Case Study Summary: Flood and Coastal Erosion Risk Management (FCERM) Strategy Roadmap to 2026, England, UK (Environment Agency, 2022)

Primary intervention type – Preventive-protective systems intervention with a strong preparedness and community resilience focus

Overview: The Roadmap signals a broadly **preventative** and resilience-building approach across policy domains that, taken together, would reduce the mental health and wellbeing impacts of flooding by lowering exposure to harm, reducing uncertainty, and strengthening **recovery** support. The strategy incorporates public health perspectives into flood risk management, treating health resilience as equally important to property flood resilience measures. Upstream actions such as better spatial planning, nature-based solutions, and resilient infrastructure to reduce the likelihood and severity of flooding; property-level resilience and "build back better" measures to lessen household disruption and trauma when flooding occurs; and improved risk information, warnings, education, and community **preparedness** (including local resilience hubs and volunteer networks) to increase people's sense of control and agency. These are coupled with downstream recovery actions – including learning from past events, improved insurance access, and clearer post-flood support pathways – which aim to shorten recovery times and mitigate longer-term psychological distress, particularly in more deprived or vulnerable communities.

3E. Case Study Summary: Room for the River, Netherlands (Ministry of Infrastructure and Water Management, the Ministry of Agriculture, Nature and Food Quality, and the Ministry of the Interior and Kingdom Relation, 2024; Rijke *et al.*, 2012)

Primary intervention type – Integrated preventive – place-based systems intervention

Overview: The Netherlands' approach aligns flood risk management, spatial planning and public health into a single, place-based system that reduces the mental health impacts of flooding by combining protection with participation and everyday wellbeing. Through programmes such as *Room for the River*, water authorities, planners and health actors co-design multifunctional landscapes that both lower flood risk and create accessible green-blue spaces that support psychological wellbeing. Early and sustained community participation reduces uncertainty and powerlessness, while visible, high-quality flood infrastructure strengthens people's sense of safety and attachment to place. When flooding does occur, recovery is treated as a joint responsibility of water governance and health systems, with coordinated psychosocial support recognising chronic flood stress as a legitimate public health concern rather than an individual problem.

3F. Case Study Summary: Climate-Resilient Construction and Planning in Herne, Germany (European Commission and the European Environment Agency (EEA), 2025a)

Primary intervention type – Regulatory and planning-based climate adaptation intervention

Overview: The city of Herne has embedded climate **adaptation** as a legally binding component of urban planning and building regulation, ensuring that flood, heat and climate risks are systematically addressed in every development decision. Through its Climate Adaptation Plan, Herne mainstreams adaptation across municipal departments and directly engages private homeowners via a mandatory climate-proofing checklist linked to the building permit process. Supported by climate risk maps, adaptation catalogues and cross-departmental coordination, the approach translates citywide resilience goals into practical, site-level action while raising public awareness and accountability. Governance features include climate adaptation made legally binding in urban planning, cross-departmental coordination, mandatory climate-proofing assessment for all building permits and evidence-based decision making via climate maps and checklists. The primary intended target population are homeowners and developers undertaking construction or renovation, and residents in flood and heat-vulnerable urban areas.

3G. Case Study Summary: Pathfinder Project, JBA Consulting, UK (JBA Consulting, 2026)

Primary intervention type – Population-level risk communication and preparedness intervention

Overview: The JBA UK multi-partner collaboration ("Pathfinder" project in the South West) brings together public agencies, emergency planners, insurers, community groups and risk modellers to create targeted resources that help communities and businesses increase awareness of flood risk and improve property flood resilience. Beyond engineering measures, the project emphasises education, **preparedness** and capability building,

equipping people with clear, locally relevant information on how to reduce vulnerability, make informed decisions, and access support before, during and after flood events. These resources include plain-language guides on property resilience options, decision aids for businesses, community workshops and sign-posting to services, all designed to reduce uncertainty, stress and loss of control that commonly accompany flooding. By connecting risk communication with practical action (e.g., resilience measures) and linking community awareness to local authority and third-sector support pathways, the collaboration helps build social capital, shared understanding and proactive coping skills, which are known to protect mental health and wellbeing. Cross-sector resource coordination reduces the psychological and practical impacts of flooding.

4. Ensuring continuity of health and social care infrastructure

4A. Case Study Summary: Førde Central Hospital Flood Protection, Norway (European Commission and the European Environment Agency (EEA), 2025b)

Primary intervention type – Critical health infrastructure climate-adaptation and resilience intervention

Overview: Førde Central Hospital, located on a river delta in a flood-prone region of western Norway, experienced major flood damage in 2014. In response, Norwegian health and planning authorities implemented a site-wide flood protection system as part of a broader hospital redevelopment plan. Completed in 2020, the intervention includes a 750-metre flood barrier, pumping station and emergency power supply, designed to protect the hospital from up to 1,000-year flood events. The measures safeguard service continuity, protect critical healthcare infrastructure and reduce risks to patients, staff and surrounding communities. This approach demonstrates that health infrastructure resilience is a mental health protection measure; regulatory flood risk assessments can catalyse adaptation investment; site-wide planning enables protection of legacy infrastructure; preventative investment is cost-effective compared to service disruption or relocation; and cross-sector governance is essential for climate-resilient healthcare systems. The governance model is based on integrated health, planning and climate adaptation and cross-sector collaboration at local, regional and national levels. The primary intended target population are hospital patients, including emergency and vulnerable patients, and hospital staff and emergency responders. Secondary target populations include the local community reliant on hospital services and wider regional population requiring emergency care.

5. Preparedness & Risk Communication Interventions

5A. Case Study Summary: Environment Agency + NHS/Local Authority, England, UK (Environment Agency, 2026)

Primary Intervention Type – Flood Warnings + NHS/Local Authority Sign-posting to mental health support

Overview: The Environment Agency Floodline system issues tiered flood warnings (Flood Alert → Flood Warning → Severe Flood Warning). During and after major flood events (e.g. Yorkshire, Somerset, Cumbria), **response** involved local authorities and NHS bodies coordinated local radio and social media updates; council webpages with clear sign-posting to mental health support; and integration with GPs, NHS 111, local IAPT services, and voluntary sector helplines. Messaging emphasises "protect people", including normalising emotional distress; advising when and how to seek psychological support; and explicit reassurance messaging ("You are not alone; help is available"). This approach is suggested to be effective because early warnings reduce panic and helplessness; trusted public bodies reduce misinformation; and simple, repeated messages lower cognitive burden during crisis. This approach however should be mindful of digitally excluded groups. Primary intended target population are flood-risk and flood-affected communities.

5B. Case Study Summary: Recovery Connect, Australia (Balance Internet, 2026)

Primary Intervention Type – Post-Disaster Mental Health Navigation

Overview: Recovery Connect provides a single, nationally branded information and referral platform following disasters (including floods). It has been used during major flood events in New South Wales and Queensland. The platform integrates mental health services; financial and housing assistance; community **recovery** hubs; and emergency worker support. One trusted source reduces anxiety and overwhelm, there is clear "what to do next" steps to restore a sense of control; and it supports stepped care (from

self-help to community to clinical). This means confusion and "service fatigue" are reduced; it explicitly includes psychosocial support pathways, not just crisis services; and is designed for both immediate distress and long-term recovery. Again this approach does require digital access which may exclude some groups, and needs strong coordination across jurisdictions. Primary intended target population are flood-risk and flood-affected communities.

5C. Case Study Summary: New Zealand (New Zealand Government, 2024)

Primary Intervention Type – All-of-Government Public Messaging (Cyclone & Flood Response)

Overview: Following major flooding and Cyclone Gabrielle the central government's **response** used plain-language daily briefings; mental wellbeing messages embedded alongside safety advice; and clear sign-posting to a mental health helpline; local Māori and community services; and GP and primary care support. Messaging explicitly acknowledged shock, grief and anxiety as normal responses; the cumulative trauma from repeated events; and culturally responsive communication strengthened trust. There was a consistent national voice; culturally appropriate framing; and clear escalation pathways for support. This approach however is resource-intensive and reliant on public trust in institutions. Primary intended target population are flood-risk and flood-affected communities.

5D. Case Study Summary: Ahr Valley & North Rhine-Westphalia (NRW), Germany (European Commission and the European Environment Agency (EEA), 2025a)

Primary Intervention Type – Flood Crisis Communication

Overview: Following the 2021 floods local authorities used multi-channel communication; community meetings; print leaflets; and local radio, with clear sign-posting to psychosocial crisis centres and trauma services. Outreach workers proactively contacted affected households. This reduced stigma by framing support as *disaster recovery*, not illness, and reached people unlikely to self-refer. The approach provided face-to-face reassurance and trust in recovery systems. It was however labour-intensive and would be hard to sustain long-term without funding. Primary intended target population were flood-risk and flood-affected communities.

5E. Case Study Summary: Cumbria, UK (Joint Emergency Management and Resilience Team, 2026)

Primary Intervention Type – Flood Recovery using Multi-Agency Hubs and Sign-posting

Overview: After repeated floods, flood **recovery** centres acted as information hubs; referral points and community spaces. Sign-posting included NHS mental health services; voluntary sector counselling; and peer and community support groups. The co-location reduced barriers to access and the social connection mitigated isolation and distress. This approach was place-based and relational; supported collective recovery, and helps to reduce stigma. It is dependent on strong local partnerships. Primary intended target population are flood-risk and flood-affected communities.

5F. Case Study Summary: Integrated Multi-Hazard Early Warning System (LIFE BAETULO), Badalona, Spain (European Commission and the European Environment Agency (EEA), 2022)

Primary intervention type – Integrated multi-hazard early warning and risk communication system

Overview: LIFE BAETULO is a pilot project that implemented an integrated, multi-hazard early warning system at city scale in Badalona, Spain. The system combines real-time data monitoring, automated risk assessment, emergency protocol activation, and clear public communication to reduce exposure and vulnerability to climate-related hazards, including flooding, storm surges, windstorms and heatwaves. By providing timely, understandable alerts and guidance, the system enables **preventive** and proactive actions that reduce physical harm, property damage, and indirect impacts such as stress, anxiety and loss of control associated with extreme weather events. Although not a clinical intervention, LIFE BAETULO directly addresses key drivers of flood-related mental health impacts by reducing uncertainty and fear through anticipation; improving warning times, a known protective factor for mental wellbeing; and supporting proactive coping and **preparedness** behaviours. This approach suggests early, clear and trusted warnings reduce psychological stress as well as physical harm; integrated systems outperform single-hazard or siloed warning tools; risk communication must include actionable guidance, not just alerts; and public-private

partnerships can accelerate innovation in urban resilience. Governance features include public-private partnerships, and integration of utilities, emergency management and urban planning. The primary intended target population are residents of Badalona exposed to climate hazards (e.g. flooding, heatwaves).

5G. Case Study Summary: Flood Hazard Identification and Mapping Program (FHIMP), Canada (Government of Canada, 2023)

Primary intervention type – National flood risk identification and mapping programme

Overview: Canada's Flood Hazard Identification and Mapping Program (FHIMP) is a national, government-led initiative to deliver free, regulatory-quality flood hazard maps for high-risk areas and, ultimately, nationwide coverage. Led by Natural Resources Canada (NRCan) with support from Environment and Climate Change Canada (ECCC) and Public Safety Canada (PS), the programme strengthens disaster resilience by ensuring that governments, communities and individuals have access to authoritative, up-to-date flood risk information. By improving risk awareness, planning certainty and **preparedness**, FHIMP contributes indirectly but significantly to reducing anxiety, uncertainty and psychological harm associated with flooding. While FHIMP does not provide direct mental health services, it addresses key upstream drivers of flood-related psychological distress such as uncertainty about risk; poor preparedness; and repeated exposure due to uninformed development. The approach demonstrates that authoritative flood risk information is foundational to resilience; free public access improves trust and preparedness; national standards reduce fragmentation and inconsistency; and risk mapping supports long-term prevention of mental health harm by reducing repeated exposure and uncertainty. Governance features are national leadership with regional implementation. The primary intended target population are Canadians living in flood-prone and high-risk areas.

6. Community Participation & Empowerment Interventions

6A. Case Study Summary: Resilient North Coast, New South Wales, Australia (Alliance for Transformative Action on Climate and Health, 2026)

Primary intervention type - Place-based community resilience and mental wellbeing hub

Overview: Resilient North Coast is a place-based, cross-sector resilience hub established by Healthy North Coast Primary Health Network (PHN) in response to repeated disasters affecting Northern New South Wales, including bushfires, floods and the COVID-19 pandemic. The initiative recognises the cumulative mental health impacts of repeated shocks and shifts away from short-term, crisis-focused recovery towards long-term community resilience building. Operating across **preparedness, response and recovery**, Resilient North Coast uses a collective impact framework to align health, community services, emergency management, local government and NGOs around locally defined priorities for mental health and wellbeing. This case study highlights that cumulative disasters require long-term, not episodic, responses; community-led action is central to mental health protection; place-based coordination improves trust and uptake; mental wellbeing must be embedded across preparedness, response and recovery; and participatory commissioning strengthens local ownership. The primary intended target population are flood and bushfire-exposed rural and regional populations.

6B. Case Study Summary: Flood Risk and Mental Wellbeing Project (WYFLIP), Kirklees, West Yorkshire, UK (van Leeuwen *et al*., 2022)

Primary intervention type – Integrated flood resilience and community mental health intervention

Overview: The Flood Risk and Mental Wellbeing Project in Kirklees integrates flood risk management, community resilience, and mental health support within the West Yorkshire Flood Innovation Programme (WYFLIP). Funded by the Yorkshire Regional Flood and Coastal Committee, and supported by the Environment Agency, the initiative responds directly to the psychological and social impacts of flooding by embedding mental health and wellbeing interventions into flood risk communities before, during and after flood events. The project combines Psychological First Aid (PFA), community-based mental health support, green prescribing, and nature-based flood activities

to reduce distress, improve **preparedness** and **recovery** and build long-term resilience. This case study highlights that mental health must be treated as core flood risk infrastructure; early, community-based intervention reduces long-term harm; green prescribing and Natural Flood Management offer dual flood and wellbeing benefits; trusted local delivery increases uptake and impact; and cross-sector governance is essential for flood resilience. Governance features include a multi-level, partnership-based governance and integration of flood risk management, public health and community development. Key partners include: Environment Agency, five West Yorkshire local authorities, Yorkshire Water, West Yorkshire Combined Authority, University of Leeds (iCASP), local Resilience Forum and emergency responders, third sector mental health and community organisations and local councillors and community groups. The primary intended target population are residents living in flood risk and flood affected communities in Kirklees.

6C. Case Study Summary: Community Resilience in Urban Areas (CRUA) – Northern Ireland (Fermanagh and Omagh District Council, 2016)

Primary Intervention Type – Community-led flood resilience and psychosocial preparedness intervention

Overview: The Community Resilience in Urban Areas (CRUA) project was a two-year, EU-funded (2015–2016) initiative led by the British Red Cross (Northern Ireland) in response to increasing frequency and severity of flooding affecting urban communities. The project recognised that communities wanted to be better prepared psychologically, socially and practically for future flood events. CRUA developed a practical, community-led resilience toolkit, placing local people at the centre of flood **preparedness, response and recovery.** Rather than replacing statutory emergency response, the programme complemented formal systems, strengthening local capability, leadership and psychosocial resilience. The approach integrated risk awareness, vulnerability assessment, emergency planning and leadership training, supported by international Red Cross and Red Crescent expertise in psychosocial support and climate resilience. The resulting toolkit provides a replicable framework for emergency planners, voluntary organisations and statutory agencies to co-design locally tailored community emergency plans, strengthening preparedness while addressing anxiety and distress linked to recurrent flooding. CRUA demonstrates that psychological resilience to flooding can be strengthened through structured community preparedness, not only through post-event mental health services. By embedding psychosocial considerations into emergency planning, the project reduced fear, uncertainty and isolation associated with repeated flooding. The governance features are a collaborative, multi-level humanitarian-statutory partnership, led by the British Red Cross (Northern Ireland) and delivery partners include local communities, voluntary organisations and statutory responders and local agencies. The intended target population are flood-prone urban communities in Northern Ireland, community leaders and volunteers, emergency planners and local responders, voluntary and community sector organisations, and statutory agencies involved in emergency management.

7.Equity-Focused Interventions

7A. Case Study Summary: Resilient Kids Program (Healthy North Coast), Australia (Healthy North Coast, 2024)

Primary Intervention Type – Targeted disaster mental health and wellbeing intervention for children and young people

Overview: The Resilient Kids Program is a $10 million, four-year (2022–2026) disaster **recovery and prevention** initiative delivered by Healthy North Coast (HNC), funded by the Australian Government through the National Emergency Management Agency (NEMA). The programme was established following the catastrophic 2022 floods in Northern Rivers, NSW, which caused large-scale displacement, housing loss and prolonged disruption to essential services. The programme supports children and young people aged 8–18 affected by flooding, with a strong preventative and resilience-building focus. It combines school-based supports, community wellbeing hubs, outreach to isolated communities, and culturally appropriate initiatives for First Nations children, aiming to reduce the long-term mental health impacts of climate-related disasters. The design is youth-informed, evidence-based and externally evaluated, contributing to the emerging evidence base on disaster mental health for children and young people. This approach demonstrates that early, preventive mental health support post-flooding can reduce long-term harm in children; school- and community-embedded models improve access and trust; youth co-design increases relevance and uptake; hub-and-spoke delivery is effective in

rural disaster-affected regions; dedicated disaster funding enables innovation beyond standard mental health services; and evaluation embedded from the outset strengthens transferability. Governance features include commissioning-based service design and youth-informed and co-designed. The primary intended target population were children and young people aged 8–18 affected by the 2022 floods in Northern Rivers. Priority groups included First Nations children and young people, children with intellectual disability or autism, and young people in rural and isolated communities. A Place-based, school- and community-embedded delivery model.

7B. Case Study Summary: Rural Adversity and Mental Health Programme (RAMHP), Australia (RAMHP, 2026)

Primary intervention type - Community-embedded mental health resilience and preparedness programme

Overview: The Rural Adversity and Mental Health Programme (RAMHP) is a place-based, community-embedded mental health resilience programme operating across New South Wales (NSW), Australia. Funded by the NSW Government and delivered through Local Health Districts (LHDs), RAMHP focuses on people and communities exposed to rural adversity, including floods, droughts and other climate-related shocks. The programme integrates mental health promotion, preparedness and early intervention into agricultural and rural systems by embedding locally recruited Coordinators who understand rural contexts and maintain trusted relationships within their communities. This approach demonstrates that embedded, trusted local roles are critical for rural mental health support; psychological preparedness can reduce disaster-related mental health harm; integrating mental health into rural and agricultural systems improves reach; stigma reduction is enhanced through non-clinical, community-based delivery; and **preparedness and recovery** should be addressed together, not sequentially. RAMHP directly addresses flood-related psychological distress in rural communities; cumulative mental health impacts of repeated climate shocks, and access barriers to mental health care in flood-prone rural areas. A governance feature is the integration with formal health systems while operating in informal community settings. The primary intended target population are people dependent on primary production and agriculture, and rural, remote and regional communities. Secondary target populations include other priority populations at higher risk of mental ill-health and communities exposed to floods, droughts and cumulative climate stressors.

7C. Case Study Summary – Rural Flood Resilience Partnership (RFRP), UK (Environment Agency, 2024)

Primary Intervention Type – Cross-sector, systems-level resilience partnership integrates flood risk management, agriculture, rural development and wellbeing

Overview: The Rural Flood Resilience Partnership (2024–2026) is a cross-sector collaboration established by the UK Government to address the disproportionate impacts of flooding on farmers and rural communities. It recognises that rural flooding affects not only homes and businesses, but also critical infrastructure, service access, agricultural productivity and mental wellbeing. Flooding in rural areas can isolate communities, damage transport, utilities and farmland, and create cascading economic and psychosocial impacts. Farming businesses face distinct vulnerabilities, including loss of livestock access, crop damage, soil degradation and long recovery times, often alongside damage to family homes. The partnership brings together flood authorities, farming organisations, rural community bodies and environmental agencies to strengthen collaboration, improve understanding of rural vulnerability, and support practical, evidence-based resilience and **adaptation** measures, including catchment-based approaches and sustainable land management. Importantly, RFRP explicitly recognises mental health and wellbeing as a core component of flood resilience, advocating for better evidence, inclusive policy design and improved access to emotional and practical support for rural populations. Governance features a multi-agency partnership model involving the Environment Agency (flood risk management), National Farmers Union (NFU), Action with Communities in Rural England (ACRE), Association of Drainage Authorities (ADA), Country Land and Business Association (CLA) and Natural England, and is aligned with the Flood and Coastal Erosion Risk Management (FCERM) Strategy and the NFU Integrated Water Management Strategy. The primary intended target populations are farmers and farming families, rural landowners and land managers and rural businesses. Secondary target populations are remote and sparsely populated rural communities and communities reliant on vulnerable rural infrastructure.

7D. Case Study Summary - Emergency Preparation and Support for Disabled People, NZ (Disability Support Services, 2024; National Emergency Management Agency, 2026)

Intervention Type – Governance and participation intervention, Inclusive disaster preparedness and recovery planning, Rights-based, co-production model

Overview: New Zealand's Emergency Preparation and Support for Disabled People demonstrates a rights-based, co-production model for disaster **recovery and preparedness**. Led by the Ministry of Disabled People – Whaikaha, and co-designed with national disabled people's organisations, the approach ensures that disabled people actively participate in recovery planning and decision-making, rather than being passive recipients of support. The model follows a "locally led, regionally enabled, nationally supported" recovery framework. Disabled people's recovery groups were established at the regional level (e.g. Tairāwhiti and Hawke's Bay) to reflect local needs while being supported by national policy and coordination. These groups represent disabled people's voices and priorities in recovery actions following emergencies, including floods and severe weather events. Preparedness is supported through accessible public emergency guidance (e.g. *Get Ready* from NZ Civil Defence), while governance arrangements embed disability inclusion into mainstream emergency management structures. Governance model is locally led, regionally enabled and nationally supported. The intended target population are disabled people affected by emergencies and disasters.

7E. Case Study Summary: Urawaka, Japan (IASC Reference Group for Mental Health and Psychosocial Support in Emergency Settings, 2021)

Primar Intervention Type – Inclusive disaster preparedness and evacuation planning (community-led, disability-inclusive DRR with accessible communication and personalised plans)

Overview: The Urakawa (Bethel House) example shows how disability inclusion, emergency management, health and local governance can be aligned to reduce the mental health harms of flooding and other hazards through **preparedness** rather than crisis response. Cross-policy action occurred when a community-based mental health service (Bethel House) worked with local government to embed disability-inclusive disaster risk reduction (DiDRR) into city planning. Tailored, accessible communication (Digital Accessible Information System (DAISY) audio materials), personalised evacuation plans, and regular training built both practical safety and psychological confidence for residents with psychosocial disabilities. By formally integrating Bethel House representatives into municipal DRR committees, the city linked social care, public health, and emergency planning systems, creating trust, clarity of roles, and rapid, coordinated action in a real disaster – reducing panic, trauma, and exposure while strengthening dignity, agency, and wellbeing for a highly vulnerable population. As a direct result of Bethel House's efforts, all residents of the group home were evacuated within the space of four minutes during the 2011 Great East Japan Earthquake and tsunami.

8.Health & Psychosocial Support Interventions

8A. Case Study Summary: Emilia-Romagna Floods, Italy (European Commission and the European Environment Agency (EEA), 2024b)

Primary intervention type – Embedded psychosocial and mental health emergency response

Overview: In May 2023, severe flooding and landslides in the Emilia-Romagna region displaced approximately 36,600 people, caused 17 fatalities, damaged critical water and sanitation infrastructure, and disrupted transport networks. A state of emergency was declared. In response, the regional authorities implemented a coordinated, emergency-focused mental health and psychosocial support (MHPSS) intervention, aligned with WHO / IASC guidelines, delivered during the acute phase and for six months post-event. The approach demonstrated that mental health support can be rapidly mobilised when embedded in civil protection systems; proximity-based outreach reduces stigma and increases uptake; network governance enables surge capacity and flexibility; alignment with international MHPSS standards strengthens legitimacy and quality; and clear transition planning is critical to avoid gaps in longer-term recovery. The governance model was networked, multi-agency delivery with clear division of roles between emergency management and health services and flexible surge capacity via voluntary and professional associations. The primary intended target population were flood-affected residents (displaced and non-displaced) and individuals experiencing acute distress or trauma. The secondary target population were children and young people (via schools), people in temporary accommodation and emergency

responders and support staff. Some limitations include time-limited support and intensity of resources.

8B. Case Study Summary: Queensland Floods, Australia (Cobham and McDermott, 2025)

Primary intervention type – targeted clinical and preventive mental health intervention (school- and community-based "screen-and-treat" model)

Overview: Evidence from post-disaster mental health interventions shows that health, education and emergency management systems can work together to mitigate the mental health impacts of flooding through early identification and timely therapeutic support. Where schools, community services and clinical mental health teams collaborate, a "screen-and-treat" model enables rapid assessment of children and families exposed to floods and other climate hazards, followed by targeted delivery of trauma-focused Cognitive behavioural therapy (CBT), Acceptance and Commitment Therapy (ACT) or related psychological therapies. Embedding these approaches in schools and local services within the first year after flooding links disaster response with public mental health prevention, reduces long-term PTSD, anxiety and depression, and supports functional **recovery**. Parent engagement, workforce training, and clear referral pathways between education, health and local authorities are critical enabling factors, while uneven family engagement and lack of controlled evaluation remain challenges. The primary intended target population are school children and their families exposed to flooding.

8C. Case Study Summary: Queensland Floods, Australia & Hurricane Sandy, USA (Crompton *et al*., 2023; Schwartz *et al.*, 2023)

Primary intervention type – Proactive population mental health screening with fast-track referral ("screen-and-link") following flooding and other climate-related disasters.

Overview: These examples show how disaster response, public health, and local service systems can be aligned to protect mental health through routine, proactive screening after floods. By embedding brief mental health checks into standard post-disaster contacts (for example via phone outreach, schools, or **recovery** services) and pairing this with rapid triage and referral into clinical or community supports, authorities can identify distress early, reduce barriers to care, and shorten the gap between exposure and treatment. The Queensland (phone-based PTSD screening programme) and Hurricane Sandy (linkage intervention and referral into care) initiatives illustrate how emergency management, health services, and community organisations can coordinate at scale to reach large numbers of affected people quickly, generating both mental health gains and potential cost savings through low-cost, high-reach delivery models. The primary intended target population were children and adults affected by floods and hurricanes.

8D. Case Study Summary: Hertfordshire County Council, UK (Centre for Climate and Health Security, 2025)

Primary intervention type – On-site psychosocial support embedded within emergency flood response (early psychological first response in evacuation settings)

Overview: This case illustrates how emergency management, local government public health, and community mental health services can be aligned during flood **response** to treat psychological care as core, not optional, relief. By placing a mental health provider directly within a rescue centre, Hertfordshire County Council linked humanitarian response, public health duties, and local mental health provision in real time, ensuring visible, accessible support alongside physical safety and housing needs. The experience also prompted system learning: the council began revising its Care of People framework and response plans to formalise mental health pathways, showing how a single incident can drive stronger integration between flood planning, civil contingencies, and mental health services for future events. Primary intended target population were flooded residents. Challenges included no clear established pathway for enacting mental health support and getting senior leaders to recognise the importance of mental health support during the flood.

8E. Case Study Summary: Intercommunal Trauma Centre, Schleiden, Germany (European Commission and the European Environment Agency (EEA), 2024a)

Primary intervention type – Integrated psycho-social crisis response and recovery service

Overview: Following severe flooding in July 2021 in North Rhine-Westphalia and Rhineland-Palatinate, the Schleiden region established an intercommunal

trauma centre to address the acute, medium- and long-term mental health impacts of flooding. The intervention provided free, accessible psychosocial and mental health support to affected residents and emergency service workers and continued, in adapted form, until the end of 2024. The approach aimed to reduce psychological harm, support recovery and strengthen community resilience. This approach demonstrated that standing psychosocial infrastructure enables continuity from emergency to long-term recovery; low-threshold, free access increases uptake and equity; intercommunal governance supports regional resilience where impacts cross administrative boundaries; specialised, multi-disciplinary teams strengthen effectiveness; and long-term funding and evaluation are critical for sustained impact. The governance model had intercommunal coordination, strong political leadership enabling rapid funding access, formalised partnerships with experienced civil society organisations and independent evaluation. The primary intended target population were residents affected by flooding, including those displaced, bereaved or traumatised. The secondary intended target population were emergency service workers and responders, children and adolescents and families experiencing ongoing stress and disruption. Limitations included resources – high staffing and specialist requirements, and funding reliance on external relief funding.

8F. Case Study Summary: Technology-enabled mental health services, Australia (Black Dog Institute, 2020)

Primary intervention type – Digital mental health delivery and sign-posting (technology-enabled screening, self-help and referral pathways integrated into disaster response)

Overview: This approach aligns digital health, disaster recovery, and community resilience policy by embedding technology-enabled mental health support into post-flood **response** and **recovery** systems. By integrating telehealth, mobile apps and curated online platforms (such as eMHprac and the Black Dog Institute Online Clinic) with emergency communications and community networks, governments and health services can expand equitable access to evidence-based care, particularly for rural, remote or displaced populations who may face service gaps, transport barriers or stigma. A central public website acting as a "single front door" after disasters helps coordinate public health messaging, clinical pathways, and community outreach, ensuring mental health support is treated as core infrastructure alongside housing, welfare and recovery assistance. The intended target population is the general public – any affected individual or community, however may be of particular value to those in rural and remote areas.

8G. Case Study Summary: The Black Dog Institute, Australia (Australian Government, 2023; Black Dog Institute, 2020)

Primary intervention type – Integrated, staged mental health system response to disasters (prevention + early identification + treatment + workforce capacity building)

Overview: The Black Dog Institute's approach, aligned with, and funded by, Australia's Disaster Mental Health and Wellbeing Framework, represents a cross-policy model that integrates emergency management, primary care, education, and community services to mitigate the mental health impacts of climate-related disasters such as flooding. Actions span the disaster continuum: in the immediate phase, they prioritise practical support, clear information, and the strengthening of social networks rather than clinical debriefing; in the intermediate phase, they promote outreach, targeted screening, problem-solving/ resilience programmes, and technology-enabled mental health care; and in the long term, they embed mental health within disaster planning, build workforce capacity (especially GPs and emergency responders), and sustain funding and community activation. Delivery is multi-sectoral – linking health systems, emergency services, local communities, and digital platforms – so that mental health is treated as core infrastructure of disaster **recovery** rather than an optional add-on. The model also explicitly recognises higher-risk groups (children, rural communities, emergency workers, and those with prior vulnerabilities) and seeks to reduce barriers to care through training, outreach, and stigma-reducing online supports. Overall, it reframes flood recovery as both a psychosocial and physical reconstruction task requiring coordinated governance across health, emergency management, and community sectors.

8H. Case Study Summary: Community-Based Public Health Nurse (PHN) Model, Japan (IASC Reference Group for Mental Health and Psychosocial Support in Emergency Settings, 2021)

Primary intervention type – Community-based, preventative and early-intervention mental health support

Overview: Japan has developed a community-based, multitasked public health nurse (PHN) model to support populations affected by natural hazards such as earthquakes, tsunamis, flooding and heavy rainfall. PHNs act as a first line of contact during and after disasters (**response**), providing basic psychosocial support, Psychological First Aid (PFA), health assessment, outreach and referral to appropriate services. The model has been widely deployed in major emergencies, including the 2011 Great East Japan Earthquake and tsunami, demonstrating its effectiveness in reaching affected populations early and reducing the risk of prolonged mental health distress. This approach has demonstrated wide coverage and early intervention; embedding mental health support in routine public health roles increases reach and sustainability; trusted community relationships reduce stigma and improve help-seeking; and early psychosocial support can prevent escalation to severe mental health impacts. The primary intended target population are disaster-affected community members and individuals in temporary accommodation. Secondary target populations are vulnerable populations, such as children, older people, and individuals reluctant to seek formal mental health services as the governance model means PHN are embedded within routine public health infrastructure. PHN provide basic support, however, not specialist mental health treatment.

8I. Case Study Summary: Resilience and Coping for the Healthcare Community (RCHC) programme, USA (Powell *et al.*, 2022)

Primary intervention type – Workforce mental health resilience intervention for emergency and health responders (group-based, trauma-informed psychological support integrated into disaster **preparedness** and **response** systems)

Overview: Evidence from the Resilience and Coping for the Healthcare Community (RCHC) programme shows that protecting the mental health of frontline and emergency responders requires coordinated action across health, emergency management, workforce planning, and occupational wellbeing systems. Effective approaches combine pre-disaster preparedness (training and peer support), surge mental health capacity during disasters, and structured post-event recovery support. Cross-policy actions include embedding trauma-informed care within emergency response frameworks, integrating psychosocial support into disaster plans, linking health services with local employers and responder organisations, and normalising group-based wellbeing interventions as core occupational health provision rather than optional extras. By treating responder mental health as critical infrastructure, these approaches reduce PTSD, secondary traumatic stress, and burnout, while sustaining service delivery for flood-affected communities. Primary intended target population were health and social care workers.

9.Housing & Financial Security Interventions

9A. Case Study Summary: Housing & Land for Flood Resilience, NSW, Australia (New South Wales Government, 2025a, 2025b)

Primary Intervention Type - Structural risk reduction and recovery intervention

Overview: Australia's Resilient Lands Program (RLP) and Resilient Homes Program (RHP) form a coordinated, post-disaster housing and land-use response following the 2022 floods in New South Wales' Northern Rivers. Together, they address a structural driver of flood-related harm by enabling voluntary relocation from high-risk areas, improving the flood resilience of existing homes, and unlocking safer land for new housing, including affordable options. It includes housing **adaptation**, relocation and land-use planning and is based on disaster **recovery** with strong **prevention** and resilience co-benefits. The programs recognise that housing insecurity and repeated exposure to flood risk are major contributors to long-term social, economic and mental health impacts. The RLP is a $100m NSW Government initiative to identify, acquire and fast-track safer land for residential development, prioritising households affected by flooding and participants in the Resilient Homes Program. It is guided by the Northern Rivers Resilient Lands Strategy, developed collaboratively with local councils and stakeholders, and seeks to correct market failures where the private housing market cannot deliver safe, affordable, or timely options. The RHP, jointly funded by the NSW and Australian Governments ($880m), provides voluntary buybacks and grants for raising, retrofitting, rebuilding or relocating homes, reducing future exposure while supporting recovery choice and dignity. This case

demonstrates that housing and land-use policy is a mental health intervention in flood contexts, even when mental health is not named explicitly. By reducing repeated exposure, displacement and uncertainty, RLP and RHP address upstream determinants of flood-related psychological harm—something often missing in flood recovery systems that focus narrowly on repair rather than relocation and prevention. The governance model is State-led and locally partnered with local councils, Landcom (state-owned property development corporation), community housing providers, and planning and housing agencies. The primary intended target population are flood-impacted homeowners in high risk areas, RHP buyback participants requiring relocation, and low to moderate-income households needing affordable housing.

9B. Case Study Summary – Managed Retreat as National Climate Policy, NZ (Ministry for the Environment, 2022)

Primary Intervention Type – Strategic, planned managed retreat (anticipatory relocation and land-use transformation as a climate adaptation measure)

Overview: New Zealand's approach to managed retreat demonstrates how flood risk management, land-use planning, housing policy, local government, and public health can be aligned to reduce the mental health impacts of flooding. Cross-policy action is achieved by embedding retreat within national climate law (Climate Change Response Act and National Adaptation Plan), enabling local councils through planning reforms, and pairing risk-reduction decisions with financial and psychosocial supports. Housing and property buyouts are coordinated with relocation assistance, community engagement processes, and culturally tailored pathways for Māori land, while health and wellbeing considerations – particularly grief, identity loss, and community cohesion – are explicitly recognised as part of **adaptation** planning. Central-local cost-sharing, transparent valuation processes, and participatory decision-making aim to reduce conflict, uncertainty, and repeated trauma, shifting the system from reactive disaster recovery to anticipatory, wellbeing-centred adaptation. The primary intended target population are households in high-risk flood locations.

9C. Case Study Summary: Flood Risk Management Sectoral Adaptation Plan (2025–2030), Ireland (Department of the Environment, Climate and Communications, 2024; Office of Public Works, 2025)

Primary intervention type – National flood risk governance and adaptation framework

Overview: Ireland's Flood Risk Management Sectoral **Adaptation** Plan (2025–2030) strengthens a whole-of-government, cross-sectoral approach to flood risk management, with increasing emphasis on non-structural measures alongside traditional engineering solutions. Key mechanisms include a targeted voluntary homeowner relocation scheme, individual property protection funding, and formal interdepartmental coordination structures to ensure flood policy aligns with housing, health, climate, and spatial planning objectives. This approach demonstrates that formal interdepartmental governance enables sustained cross-policy alignment; non-structural measures are increasingly central to flood adaptation; targeted retreat mechanisms can be politically acceptable when framed as humanitarian support; and flood policy benefits from explicit links to health, housing and climate governance, even where mental health impacts are implicit. Governance features a lead body (Office of Public Works (OPW), who are the national lead for flood risk management); an interdepartmental flood policy coordination group, which is a whole-of-government body; and a National Adaptation Steering Committee with representatives from OPW, Departments of Health, Housing, Agriculture, Transport, Climate, Finance and Enterprise; Environment Protection Agency and Met Eireann, Climate Action Regional Offices and the Climate Change Advisory Council. The primary intended target population are households in high-risk flood locations and homeowners with no feasible structural flood protection options. Secondary target populations are flood-affected businesses, local authorities in high-risk areas and communities experiencing repeated flood exposure.

9D. Case Study Summary – Mental Health Support for Flood-Affected Policyholders, Zurich, UK (Goering, 2021)

Primary Intervention Type – Post-disaster psychosocial support, private-sector mental health intervention, insurance-linked wellbeing support

Overview: Zurich UK has integrated free mental health counselling into its flood insurance claims process, recognising that flooding causes not only physical damage but also significant psychological distress, including anxiety, depression and trauma. Beginning as a pilot, Zurich now offers up to five one-hour counselling sessions to flood-affected households as a standard part of its flood policies. The intervention is triggered at the point of claim and delivered alongside property repair and **recovery** support. This represents an early example of the private insurance sector embedding mental health recovery into disaster response, complementing public-sector flood recovery systems. Governance features a voluntary corporate action rather than mandated provision. The primary intended target population are Zurich UK policyholders whose homes have been flooded.

9E. Case Study Summary – Aviva, UK (Building Future Communities, Aviva, 2025)

Primary Intervention Type – private sector intervention, digital app to support customers in high flood risk areas to prepare for future flooding

Overview: Aviva insurers are collaborating with property flood resilience data experts to support customers in flood risk areas to prepare for future flooding. Customers can sign up to an app which provides access to flood alerts, guidance on creating a flood plan, and actionable steps to protect their property. How customers engage with the app will provide valuable insights into their needs and behaviours around flood preparedness and resilience, helping Aviva better support them in the future. The app has been trialled in England but it is unclear if it has yet been trialled or implemented in Scotland. Primary target populations are customers in high flood risk areas.

Appendix 2.2 (Workstream 2): Policy mapping

Documents analysed and included in the map:

The Scottish National Adaptation Plan 2024-2029; National Flood Resilience Strategy; Scotland's Population Health Framework 2025-2035; PHS Plan 2024-2027; Climate Emergency and Sustainability Strategy 2023-2026; The Adverse Weather and Health Plan 2024-2027; Mental Health and Wellbeing Strategy; NHS Scotland Climate Emergency and Sustainability Strategy; CCRA3 Summary for Scotland.

Policies not in the map: The National Planning Framework 4; **Equality & Inclusion:** A Fairer Scotland for Older People: Framework for Action (Scottish gov); Equally Safe: Scotland's Strategy for Preventing and Eradicating Violence against Women and Girls Dec 2023 ; **Housing:** Policy on Housing Standards; The Repairing Standard Statutory Guidance: Housing Standards and Quality Directorate for Local Government and Housing ; A New Deal for Tenants: Draft Strategy Consultation Paper December 2021; **Children & Young People:** Recommendations made by the Children and Young People's Mental Health and Wellbeing Joint Delivery Board Final Report; Children and Young People (Scotland) Act 2014: Statutory Guidance on Part 3: Children's Services Planning – second edition 2020; Universal Health Visiting Pathway in Scotland: Pre-birth to pre-school. **Health & Social Care:** National Care Service: Governance and representation – co-design report; Getting it Right for Everyone (GIRFE); Health and Social Care Service Renewal Framework; NHS Scotland operational improvement plan. **Population Health:** National Care Service Socioeconomic inequality and barriers to primary care in Scotland: A literature review. **Planning & Infrastructure:** Green Infrastructure: Design and Placemaking. **Justice:** Mental Health and Wellbeing Delivery Plan 2023-2025

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