

Written evidence from the Institution of Mechanical Engineers to the UK House of Commons Environmental Audit Committee inquiry on Flood resilience in England

January 2025

About the Institution of Mechanical Engineers

The Institution of Mechanical Engineers (IMechE) represents 112,000 engineering professionals and students in the UK and across the world. The Engineering Policy unit (EPU) of the IMechE informs and responds to UK policy developments by drawing on the expertise of our members and partners. This response has been prepared by the EPU with input from the IMechE's Climate Adaptation working group.

Strengthening flood resilience

- 1. To what extent are current flood resilience assets and interventions fit-for-purpose and what are the strengths and weaknesses? Are there alternative approaches from across the UK and elsewhere which could help inform improvements and innovation?**

Current flood resilience assets and interventions are falling short of addressing the increasing intensity and frequency of extreme weather events driven by climate change. While there are notable strengths, such as well-established frameworks for emergency response and the robustness of certain "hard" infrastructure solutions, the system's overall capacity is often insufficient to meet emerging challenges. There is a growing recognition of the importance of nature-based solutions, but their integration into existing strategies remains limited. Additionally, much of the infrastructure is ageing, which exacerbates vulnerabilities and limits resilience. Projects like London's new super sewer, the 'Tideway Tunnel,' address some of the challenges posed by old drainage systems dating back to Victorian times; however, many feed drains remain inadequate.^[1] Additionally, large infrastructure such as the Thames Barrier and aging dams, like those highlighted during the Whaley Bridge incident in 2019, may require significant upgrades to meet future demands.^[2]

Looking globally, there are valuable lessons for enhancing and innovating flood resilience strategies. For instance, the Netherlands' "Room for the River" programme demonstrates the effectiveness of combining traditional engineering with nature-based solutions, such as floodplain restoration, to create more adaptive systems.^[3] Similarly, Hong Kong's stormwater management strategies exemplify innovative approaches that integrate urban planning, green infrastructure, and advanced technology.^[4] Adopting elements of these programmes could enhance the effectiveness and sustainability of flood resilience efforts in the UK.

- 2. How appropriate is the current balance between 'green' nature-based solutions and 'grey' hard infrastructure resilience assets, and what adjustments, if any, are needed to improve it? What role can natural flood management techniques, such as wetland restoration and tree planting, play in enhancing flood resilience while contributing to broader biodiversity and climate objectives?**

¹ <https://www.tideway.london/the-tunnel/>

² <https://www.bbc.co.uk/news/uk-england-derbyshire-49189955>

³ <https://www.dutchwatersector.com/news/room-for-the-river-programme>

⁴ <https://www.c40.org/case-studies/cities100-hong-kong-stormwater-management-prevents-flooding/>

Historically, flood resilience strategies have heavily relied on "grey" hard infrastructure, such as flood defences and drainage systems, to manage water and mitigate risks. While these traditional solutions remain critical, there is growing recognition of the need to incorporate "green" nature-based solutions, such as wetland restoration and tree planting, into flood management strategies. For example, The Lower Otter Restoration Project in East Devon is an initiative that employs nature-based solutions to address coastal flooding from sea level rises. By realigning the river to its natural course and creating new wetlands, the project enhances biodiversity, improves flood resilience, and restores vital ecosystems, showcasing a sustainable approach to climate adaptation. A hybrid approach that balances green and grey infrastructure is increasingly seen as the most effective way to address both flood resilience and broader environmental challenges.

Nature-based solutions offer multiple benefits beyond flood mitigation. Techniques such as wetland restoration and tree planting can enhance biodiversity, sequester carbon, and improve water quality, contributing to broader climate and ecological objectives. However, these approaches often require significant space and careful planning, which can be a challenge in urbanised or densely populated areas. Recent initiatives, like Severn Trent's £76 million investment in sustainable drainage systems (SuDS) in Mansfield, highlight the potential of green infrastructure.^[5] These systems aim to store over 58 million litres of surface water, effectively functioning as a "giant sponge" to reduce flood risk while delivering environmental co-benefits.

3. What changes to the planning system and building regulations are needed to ensure that buildings and infrastructure are resilient to flooding in the short, medium, and long-term? What long-term land use strategies and approaches to flooding should the government consider, especially for communities that cannot be protected from flooding or inundation?

To ensure buildings and infrastructure are resilient to flooding, building regulations should incorporate robust flood resilience standards, such as requiring raised floor levels and the use of flood-resistant materials. Strengthening and stronger enforcement of planning policies is essential to limit surface sealing and restrict developments in medium- to high-risk flood-prone areas, reducing vulnerability.

Planning regulations for extensions have been continuously eased to address the housing shortage and support the building industry. The vast majority of extensions, however, only provide more available living space per head, but lead to increased pressures on draining systems and substantial loss of untouched ground.

For communities that cannot be fully protected from flooding, the government should consider long-term land use strategies, including managed retreat. This approach involves supporting communities in relocating from high-risk areas while restoring floodplains and wetlands to enhance natural flood management. These strategies must be underpinned by comprehensive support for affected communities to ensure a just and equitable transition.

⁵ <https://www.stwater.co.uk/wonderful-on-tap/green-recovery/mansfield-sustainable-flood-resilience/>

Monitoring flood resilience

- 4. To what extent are current metrics for monitoring the effectiveness of flood resilience fit for purpose, and what improvements could make them more effective?** Do current metrics capture the range and effectiveness of privately-owned flood resilience assets, and if not, how can this be improved? Do we have appropriate metrics and mechanisms to measure the cost effectiveness of flooding assets and interventions in terms of investment versus long-term savings and, if not, what should they look like?

Current metrics for monitoring flood resilience often focus on short-term effectiveness rather than long-term outcomes, limiting their ability to support sustainable planning. To improve, there is a need for tools that evaluate cost-effectiveness over the entire life cycle of assets, including maintenance and operational costs, rather than just initial investment.

Coordination of flood resilience

- 5. How effectively and how frequently do flood risk management authorities work together to tackle flooding issues and do they have sufficient resources and skills available to carry out their work?** For instance, how can the government ensure that areas prone to flooding near the mouth of a river, are not negatively impacted by increased pressure on the river, or by flood-mitigation measures taken upstream? Where is the interface between the responsibilities for river and surface water flooding, and how could monitoring and coordination be improved to enhance effectiveness and early warning of flooding?

Collaboration between flood risk management authorities is essential but often inconsistent, with gaps in resources, skills, and coordination. Local authorities, for instance, frequently lack the staffing and expertise needed to effectively enforce regulations. Government intervention, through more directive top-down guidance, could standardise monitoring and enforcement, ensuring more consistent application of strategies across regions.

In areas prone to flooding near river mouths, the government should ensure upstream flood-mitigation measures do not inadvertently increase downstream risks. Improved coordination between authorities responsible for river and surface water flooding is critical, supported by better monitoring systems and shared data. Addressing the gradual reduction in natural “sponginess” due to urbanisation and loss of green infrastructure must also be prioritised, with stronger policies to protect and restore these natural assets.

- 6. What should the key priorities be for the Flood Resilience Taskforce, and how can it enhance coordination and improve flood resilience?** Is there a role for community-based flood response teams, and who is responsible for building that resource?

The Flood Resilience Taskforce should prioritise long-term resilience planning, integrating nature-based solutions with traditional grey infrastructure, and improving the enforcement of flood management policies. Enhancing coordination between flood risk management authorities through shared monitoring systems and top-down guidance is essential.

- 7. Is there a backlog in maintenance of existing flooding adaptation/resilience assets and in identifying where new ones could be introduced?** Is there clarity about whose responsibilities these are, and how could this be improved? How strong is the knowledge base on both the condition of existing assets and where new ones might be needed and what steps could strengthen it?

There is a notable disparity in the maintenance of flood resilience assets. While hard engineering solutions often have clear maintenance plans, sustainable drainage systems (SuDS) frequently lack equivalent provisions. This gap highlights a broader issue of unclear responsibilities and inconsistent practices. Strengthening the knowledge base on the condition of existing assets and identifying where new ones are needed requires standardised monitoring frameworks and improved coordination between authorities.

Resources, funding and support for flood resilience

- 8. What level of flood resilience is required to address the flood risks identified in the Climate Change Risk Assessment and is current funding adequate to meet these risks effectively?** Is there sufficient government support and funding for the maintenance of privately-owned flood defence and resilience assets? What changes, if any, should be made to the next iteration of the Flood and Coastal Erosion Risk Management (FCERM) investment programme to improve its outcomes? How well does the National Adaptation Plan address the need for flooding adaptation measures, and what additional steps should be taken to ensure effective long-term flood resilience in high-risk areas?

Current funding levels for flood resilience may be insufficient to address the escalating risks identified in the Climate Change Risk Assessment. With one in four properties in England projected to be at risk of flooding by mid-century, the urgency to enhance flood resilience is clear.^[6] Flooding from rivers, the sea or surface water already puts 6.3 million properties in danger and higher global temperatures are set to push that total to 8 million by 2050. While the government has doubled its capital funding for flood risk management in England for the six years leading up to 2027, the Environment Agency forecasts that flood protection will be provided for at least 40% fewer properties than planned, due to factors including inflation and bureaucratic delays.^[7, 8] The recent devastation caused by Storm Bert has further emphasised the urgent need to prioritise flood defences in vulnerable areas.

Enhancements to the Flood and Coastal Erosion Risk Management (FCERM) investment programme should prioritise long-term resilience over reactive measures and increase funding for integrated green-grey infrastructure projects. Additionally, it should seek community engagement to ensure local needs and risks are being addressed. Planning regulations should ensure new housing developments incorporate adequate drainage systems and are situated away from high-risk flood zones can prevent exacerbating flood risks.^[9]

⁶ <https://www.gov.uk/government/publications/national-assessment-of-flood-and-coastal-erosion-risk-in-england-2024/national-assessment-of-flood-and-coastal-erosion-risk-in-england-2024>

⁷ <https://www.nao.org.uk/reports/resilience-to-flooding/>

⁸ <https://committees.parliament.uk/work/7973/flood-defences/news/199357/flood-resilience-eroded-by-poorly-maintained-defences-with-government-in-the-dark-on-progress>

⁹ <https://www.ft.com/content/73a8906b-af0b-48f5-bae2-09ce38c4dd90?utm>

9. How can the Government encourage more long-term private investment in flooding defences and resilience measures? What role can the insurance industry play in supporting this?

The government can adopt several strategies to facilitate this investment. Collaborative projects between the government and private sector through public-private partnerships can pool resources and expertise for large-scale flood defence initiatives, distribute costs and benefits, improve financial security, and therefore make investments less risky and more attractive to private entities. The offer of tax reliefs or grants to private companies investing in flood resilience can lower financial barriers and encourage participation. These incentives can make investments in flood defences more financially viable for private investors. This is something that should be considered for all climate adaptation investments.

The insurance industry also plays a critical role. Insurers can promote property resilience through incentive schemes or grants, including premium reductions, to facilitate implementation of flood resilience measures into existing housing stock. Programmes like the "Build Back Better" run by FloodRe, encourage property owners to incorporate flood-resistant materials and designs during repairs, enhancing overall resilience.^[10]

10. What support do property owners and neighbourhoods require to enhance their resilience to flooding? What is the current level of awareness among property owners about flood resilience measures, how they can be improved, and who can support it?

Property owners, particularly those who have not yet experienced flooding, require greater awareness and education about flood resilience measures. This includes understanding the impacts of sealing natural ground and the importance of emergency preparedness training. Local authorities, insurers, and community organizations can play a key role in raising awareness and providing support for implementing resilience measures.

¹⁰ <https://www.floodre.co.uk/buildbackbetter/>