



**Flooding Resilience
October 2024**

Building nature-based resilience to flooding

Summary

Nature is our first line of defence against flooding. Nature based solutions can reduce the impacts of climate change while also delivering other benefits, such as habitat creation and carbon sequestration. Restoring, conserving, and enhancing our freshwater environments should be seen as a priority so they are sufficiently resilient to meet the challenges ahead. To do this we must:

- Restore riparian habitats
- Employ a catchment-based approach
- Promoting sustainable farming practices
- Enhance funding and financial incentives
- Improve the evidence base and monitoring
- Integrate Natural Flood Management with other environmental objectives

Background

The impact of climate change is becoming increasingly prevalent, and adaptation to its effects is increasingly salient. A warmer climate will bring an increase in winter rainfall and periods of short, intense rainfall in summer, while also contribute to sea level rise. This will strain the current capacity to absorb water and mitigate flooding, increasing flood exposure across Scotland.

SEPA estimates that 284,000 properties, businesses and services are currently at risk in Scotland, and this is expected to increase to almost 400,000 by 2080 as a result of climate change. Peak rainfall intensities and river flows are expected to increase by 50% and 60% respectively, and sea levels around the coast of Scotland will continually rise at faster rates, and are predicted to be between 80cm 1.9m higher by 2100.

Scotland, and the world, is facing a twinned climate and nature crisis. Building resilience to the climate crisis and nature restoration must go hand in hand through effective nature based solutions which deliver multiple benefits, such as sequestering carbon emissions, creating habitats for wildlife, and mitigating the impacts of the climate crisis. Restoring our freshwater habitats, in particular, can make an important contribution to building resilience to flooding. Nature-based solutions allow for a long-term strategy of climate resilience and should therefore be looked on as the first-choice option.

The Scottish Government has made some progress in addressing this issue – NPF4, Scotland’s National Planning Framework, aims to strengthen resilience to flooding by both promoting avoidance of flood risk and reducing vulnerability of flood prone areas. It is also in the process of developing a flood resilience strategy as part of Scotland’s National Adaptation Plan to focus on building flood resilience amongst communities. However, further effort is required in this area to make Scotland truly resilient to the challenges posed by increased flood risk.

The Flood Risk Management (Scotland) Act 2009 encourages natural flood management (NFM) through several key provisions and mechanisms, although it doesn't explicitly use the term "natural



flood management." While the Act itself provides the framework, subsequent guidance and strategies developed under its authority have more explicitly promoted NFM techniques.

It's important to note that the Act's encouragement of NFM is part of a broader, integrated approach to flood management. It doesn't exclude traditional engineered solutions but rather promotes a balanced approach that includes both natural and engineered measures where appropriate.

The implementation of Natural Flood Management (NFM) in Scotland has encountered several barriers despite the supportive framework provided by the Flood Risk Management (Scotland) Act 2009. From a scientific and technical perspective, one of the primary hurdles has been the difficulty in quantifying the benefits of NFM measures, particularly at larger scales. The complexity of natural systems and the lack of long-term data make it challenging to predict and demonstrate the effectiveness of these approaches with certainty. This uncertainty can make it harder to justify NFM projects when compared to more traditional flood defence methods.

Economic and financial barriers also play a significant role. Despite some dedicated funding, NFM often competes with traditional engineered solutions for limited resources. The long-term maintenance costs of NFM measures and the need to compensate landowners for changes in land use can be significant financial hurdles. These economic challenges can make it difficult to secure sustained investment in NFM projects.

Social and cultural factors present another set of obstacles. There can be resistance to change among landowners and farmers who may be reluctant to alter traditional land management practices. Additionally, there's sometimes a lack of awareness about the benefits of NFM among stakeholders and the general public. Some communities may also feel more secure with traditional, visible flood defenses, making it harder to gain support for NFM approaches.

Institutional and governance barriers further complicate the implementation of NFM. These measures often require coordination across different property boundaries and jurisdictions, which can be challenging to navigate. Aligning NFM with other land use policies and regulations can be complex, and institutional inertia within some organisations can slow the shift from traditional flood management approaches.

Legal and regulatory issues, such as land ownership complications and liability concerns, can also hinder NFM implementation. Questions about who is responsible if NFM measures fail can create reluctance among potential implementers. Furthermore, there are challenges related to technical capacity, with potential skill gaps in designing and implementing NFM measures, despite improving guidance.

The time scales involved in NFM can be problematic as well. These measures often take time to become fully effective, which can conflict with desires for immediate flood protection. This delayed impact can make it harder to garner support and maintain momentum for NFM projects.

Monitoring and evaluation present their own set of challenges. It can be difficult to attribute flood risk reduction specifically to NFM measures among other factors, and long-term monitoring programs can be expensive to maintain. Finally, landscape and climate factors add another layer of complexity, as not all areas are equally suitable for NFM measures, and changing climate patterns introduce additional uncertainty into NFM planning.

Despite these barriers, progress is being made in addressing many of these challenges through ongoing research, policy development, and practical experience. The Scottish Government, SEPA, and



various research institutions continue to work on overcoming these obstacles to facilitate wider implementation of NFM across Scotland.

What action is required?

- Restoration of riparian habitats: Restoring, enhancing and protecting riparian habitats, the land adjacent to a freshwater body, is a valuable line of defence against flooding. These habitats play a key role in mitigating the effects of flooding through dissipating the speed and volume of flood water, reducing impacts downstream. Riparian areas can absorb and store water during high flows and slowly release it, reducing the likelihood of surrounding land becoming overwhelmed with flood water.
- A catchment-based approach: Natural flood management techniques play a crucial role in mitigating flood risks. This involves planting trees and restoring wetlands to slow water flow, creating flood plains to allow rivers to expand safely, and restoring meandering river courses. These measures work with nature to reduce the speed and volume of floodwater. These techniques work best when they are employed on a catchment wide basis so that the flow of water is managed from source to sea.
- Promoting sustainable farming practices: This can play a significant role in flood management. Encouraging soil management techniques that reduce runoff and promoting crop rotation and cover crops to improve soil structure can help mitigate flooding at its source. By combining these various approaches, Scotland can work towards reducing the impact of river flooding and creating more resilient riverside communities.
- Enhance funding and financial incentives: Establish dedicated, long-term funding streams for NFM projects. This could include creating a specific NFM grant programme or integrating NFM more prominently into existing flood management budgets. Additionally, develop financial incentives for landowners and farmers to implement NFM measures, such as payments for ecosystem services or for land used in NFM schemes.
- Improve the evidence base and monitoring: Invest in long-term monitoring programmes to build a robust evidence base for NFM effectiveness, focussed on existing and new demonstration sites. Use this data to develop more accurate models for predicting NFM outcomes, helping to reduce uncertainty and build confidence in these approaches.
- Integrate NFM with other environmental objectives: Align NFM initiatives with other environmental goals such as biodiversity enhancement, water quality improvement, and carbon sequestration. This could help attract additional funding and support from various sectors.

Scottish Environment LINK is the forum for Scotland's voluntary environment community, with over 40 member bodies representing a broad spectrum of environmental interests with the common goal of contributing to a more environmentally sustainable society.

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