
Guidance on the delivery of Natural Flood Management

Summary

There is growing interest in the application of Natural Flood Management (NFM) in the UK with some notable examples in Pickering, Belford and Stroud. For NFM to have any significant impact on managing flood risk and delivering multiple benefits schemes need to be technically robust and simple to deliver. This project will develop guidance that augments existing case studies, research frameworks and high-level guidance to present a formal design approach and design criteria that provides confidence in NFM and ensures the right outcomes are delivered.

Background

Working with Natural Processes (WWNP) provides better flood risk management and also has the potential to deliver other benefits, like water quality improvement and provision of amenity. In the UK, Natural Flood Management (NFM) is now increasingly used to cover WWNP and describe this way of working. The overall aim is to 'protect, restore and emulate the natural functions of catchments, floodplains, rivers and the coast' (Pitt, 2008). NFM can take many different forms and can be applied at different scales, in urban and rural areas, and on rivers, estuaries and coasts.

A wide range of measures can be used to reduce flood risk by slowing, attenuating and storing runoff and flows whilst achieving other benefits. For example, restoring peat moorlands, targeted woodland planting, and improving floodplain connectivity could help reduce flood risk to communities downstream. We can combine and complement more traditional hard engineering flood risk management infrastructure with NFM to manage overall flood risk, improve resilience and improve our local environment.

The suitability and effectiveness of NFM measures will be site specific and depends upon many factors, including catchment characteristics, the location and scale at which they are used. Flood risk management measures are normally chosen from a continuum of options ranging from traditional forms of engineering through to more natural systems. In some cases NFM measures are the only choice where other options are not cost beneficial.

There is potential for well planned, designed and constructed NFM measures to protect and enhance natural processes and be more beneficial than traditional hard engineering solutions thereby contributing more ecosystem services and natural capital.

Over recent years there has been considerable interest in the contribution that NFM can make to managing flood risk. The Joint Defra / Environment Agency Flood and Coastal Erosion Risk Management Research and Development Programme funded the development of an NFM evidence directory that looked at fourteen NFM measures (see [here for more information](#)). This directory underpinned by a detailed literature review with links to 65 practical case studies, should form the basis of future work on NFM. UK governments and the devolved administrations have also supported and funded a number of schemes to deliver NFM. The most significant initiative being Defra's provision of £15M for 58 NFM schemes. The Natural Environment Research Council (NERC) also has a national research programme to improve understanding of the effectiveness of different NFM measures. There is also work being progressed by the US Army Core of Engineers (USACE) and Rijkswaterstaat in Holland that can help inform a UK approach to NFM guidance.

A recent survey on the need for guidance on NFM measures (undertaken by the Environment Agency during spring/summer 2018) identified four measures that guidance should be prioritised for, these include:

- Floodplain and wetland restoration
- Flow path interception on farms (ditches, fields, paths, tracks, roads)
- Leaky woody barriers/dams
- Runoff attenuation features

The variation and extent of these features will be clarified during the engagement process. The proposed guidance on NFM measures will be phased, to initially cover these prioritised NFM measures with the structure of the guidance allowing future updates and inclusion of new measures as evidence and new funding become available.

Justification

Despite the growing evidence base there is still some uncertainty about approaches to robustly plan, design, construct and maintain NFM measures. Guidance is required to provide confidence that NFM measures can be designed to adequately manage flood risk and deliver multiple benefits throughout their life. These uncertainties combined with a lack of confidence in NFM performance may mean an over reliance on the traditional hard engineering approaches. This can lead to lost opportunities, more expensive and in some cases less beneficial solutions which achieve fewer ecosystem service benefits. More needs to be done to mainstream the use of NFM and the production of collaborative and consensus based guidance is fundamental to this process.

It is vital that the growing evidence base (both in the UK and overseas) is used to develop guidance on the delivery of NFM for a variety of audiences. A simple design framework that includes principles, design criteria and technical information is required to provide stakeholders confidence in the value of NFM. It is also important that guidance consolidates experience, evidence and good practice gathered by different stakeholders at a variety of scales and this is effectively shared.

At a local community and practitioner level there is growing interest and enthusiasm in the application of NFM approaches. Guidance will provide a useful design framework that combines experience, sound engagement, local characteristics and decision making with robust engineering principles.

The Environment Agency's National Engineering panel has identified that design guidance is needed by the engineering and asset management community so that when they are developing flood risk management schemes they are able to:

- identify suitable NFM measures which could be constructed to reduce flood risk
- understand design requirements for specific measures so that they can be fully costed in business cases including and understanding of their design-life and whole life costs
- specify design requirements to contractors who are employed to construct the measures

The development of a national NFM guide will save resources (time and money) when compared to a fragmented approach where stakeholders are either 'learning by doing', or developing their own guidance. It will support engagement with stakeholders, an inclusive, pragmatic but formal design framework, as well as appropriate decision making and the delivery of robust NFM measures that are sympathetic to the catchment and easier to manage over their lifetime.

Outcomes and benefits

A number of stakeholders will benefit from guidance on NFM. The key target audience and beneficiaries are likely to be those managing or living with flood risk. This includes local community groups, landowners, environmental regulators, local government as well as consultants and contractors involved in flood risk management. The

overall outcome is to improve confidence in the delivery of NFM, enabling clients to be more intelligent and providing practitioners with information, guidance and examples to improve the robustness of measures.

The expected outcomes and benefits of this project are to:

- **Improve and raise awareness of evidence** – while there has been a programme to raise awareness of the opportunities and evidence surrounding NFM additional work is required to focus on the delivery of measures on the ground.
- **Formalise the NFM planning and design process** – much of the delivery of NFM in the UK is based on local ‘engineering experience’ and a ‘learning by doing’ approach. This guidance provides an opportunity to codify some of this good practice and formalise a generic approach into an accepted design framework, set of principles, design criteria informing robust guidance on measures.
- **Improve confidence** – Many Risk Management Authorities (primarily Lead Local Flood Authorities) and local community groups are looking to NFM to help reduce flood risk. The delivery of consistent guidance based on evidence and examples provides an opportunity to support clients enabling them to be more ‘intelligent’ in decision making and specifying NFM. The guidance will also provide practitioners with the technical detail required to ensure that NFM delivers the required outcomes and performance.
- **Support local delivery** – The guidance will be written to enable decisions to be made by clients and community groups based on local opportunities and challenges. The guidance around the design framework, principles and decision making will be accessible to non-technical and engineering specialists to enable informed local decisions that are sympathetic to the community and catchment.
- **Mainstream the use of NFM** – This project will build on the evidence base, to inform guidance on the delivery of cost effective NFM. Guidance that provides a design framework and provides more confidence will support delivery, the acceptance and mainstreaming of NFM.
- **Support the delivery of multiple benefits** – NFM measures have the potential to deliver many ecosystem services and support the provision of natural capital. The guidance will include design criteria that supports key outcomes from designing for multiple benefits (to be consulted on).
- **Free access to good practice** – Free and readily accessible guidance will be provided on NFM. Supporting a consistent approach to the delivery of NFM.
- **Underpin policy delivery** – Guidance on NFM will underpin UK government, devolved administration policy initiatives supporting NFM that includes:
 - National and local flood risk management strategies in the UK
 - The Catchment Based Approach
 - Initiatives and funding programmes to promote the delivery of NFM (Defra £15m NFM programme, NERC £3.4m NFM programme)
 - Area Integrated Plans
 - The 6 year FCRM investment plan
 - Defra’s 25 year Environment Plan
 - Natural capital accounting (on assets and liabilities)
 - Resilience and climate change adaptation
 - Partnership Funding – particularly for surface water and NFM projects
 - Water industry business planning cycles (potentially PR19/24)
 - Green infrastructure delivery

Aims and objectives

The overall aim of this project is to support the delivery of NFM by producing accessible and helpful guidance on the delivery of NFM with a focus on improving confidence and reducing the risk of poor performance of NFM measures. The specific objectives of the project are to:

1. Engage with the wide range of organisations and disciplines with an interest in NFM to understand:
 - a. Common definitions and characterisation of NFM measures
 - b. Common NFM delivery challenges and approaches to overcome them
 - c. Elements for inclusion in an NFM design framework (principles, objectives and design criteria)
 - d. Whether there are additional case studies for the prioritised NFM measures (as indicated by the survey)
 - e. Stakeholder requirements in terms of content and format of guidance
2. Specifically support relevant NFM projects being delivered as part of Defra's £15M NFM funding initiative.
3. Ensure UK NFM guidance takes account of the latest and best available (national and international) evidence and guidance.
4. Develop guidance on the planning, design, construction and maintenance of NFM that provides a generic design framework and detailed guidance on four different NFM measures. This includes specific guidance on:
 - a. Design requirements for measures so they can be effectively costed, including an understanding of their design life and whole life costs.
 - b. The level of flood risk management provided by the NFM approach and specific measures.
 - c. The delivery of multiple benefits (in addition to reduce flood risk), i.e. sediment capture, water quality improvements, good practice habitat creation.
 - d. The construction and inspection of NFM measures.
5. Disseminate the guidance widely to encourage the appropriate delivery of NFM.

Outputs

The target audience for the guidance is diverse, with different responsibilities and technical understanding of flood risk, particularly NFM. The type organisations and job functions likely to be interested in applying the guidance include:

- Flood Risk Management Authorities (LLFA, Regulators, IDBs, WaSCs, HE) *
- Landowners/land managers *
- Environmental regulators
- Rivers Trusts and other relevant NGOs*
- Local community groups/Catchment partnerships *
- Local government decision makers *
- Flood risk engineers *
- Landscape architects *
- Engineering and landscape contractors *
- Ecologists
- Academics

* prioritised audiences.

The guidance will be structured in a way that aligns with particular audiences. The introduction and design framework (including the principles and their application) will be written for a non-technical audience. Guidance and information on applying the principles, the design criteria and specific measures will be written for a more technical audience.

The outputs will be easy to use, simple with plenty of checklists, images and design examples. The earlier sections of the guidance will be presented in an accessible and inspirational way. The design criteria, their application and guidance on specific measures will be more technical providing the information required for practitioners ranging from those wanting 'rules of thumb' and those wanting a more robust methodology.

The guidance on individual NFM measures will be consistently structured and produced in volumes to enable future inclusion of different measures in the future. A number of design approaches for each measure will be presented, related to specific design criteria, opportunities, constraints and performance requirements.

The specific deliverables include:

1. An updated literature review on prioritised NFM measures capturing new case studies and relevant international guidance. This will be a 'light touch' review primarily to augment and build on previous work (rather than duplicating it).
2. A detailed scoping report – presenting information on the literature review engagement. It will also present initial thoughts on:
 - a. Definition and characterisation of NFM
 - b. Proposed NFM design framework (including principles, objectives and design criteria)
 - c. Selection of NFM measures
 - d. Guidance to overcome delivery challenges
 - e. Conceptual/outline guidance for prioritised NFM measures (covering design, construction, O&M)
 - f. Recommendations for the content and structure of full guidance on NFM
3. Guidance on the delivery of NFM will be consulted on, however it is likely to include :
 - a. Introduction and benefits of NFM
 - b. Overall design framework of NFM
 - c. NFM design principles
 - d. NFM design criteria (ie requirements)
 - e. Applying the design framework
 - i. Planning NFM
 - ii. Stakeholder engagement
 - iii. Applying the design principles
 - iv. Delivering the design criteria
 - v. Selection of NFM measures
 - vi. Costs and benefits of NFM
 - vii. Overcoming challenges
 - f. Constructing NFM
 - g. Maintaining and operating NFM
 - h. Managing risk (health and safety, consents and liabilities)
 - i. Individual NFM measures (x 4 - including specifics on delivering the principles and design criteria, construction and maintenance requirements)
4. PowerPoint presentation (with notes) providing a summary of the guidance and showcasing one case study.

Approach and methodology

The extensive contacts of CIRIA, the project team and partners will be used to exploit synergies with other initiatives and organisations to produce consensus based guidance and champion the final outputs. The project will be managed to foster collaboration and consensus as well as utilise extensive links and momentum with related initiatives.

A Project Steering Group (PSG) representing project funders and the target audience will be independently chaired to inform and steer the project, reviewing the quality of the outputs and acting as champions for the outputs. The PSG will also be augmented by a Reference Group (maximum 30 individuals) made up of representatives of those delivering relevant NFM measures as part of the Defra funded projects.

The outputs from WWNP will be utilised when developing the guidance and the results of the Environment Agency survey will be used to focus work on augmenting the evidence base and development of guidance on specific NFM measures.

The project will involve the following three phases of work:

1. PHASE 1 - Scoping

This phase will initiate engagement on requirements and existing practices within the industry. A focussed literature review will be undertaken (building on the WWNP outputs) to ensure the latest national and international evidence has been exploited for the overall process and prioritised NFM measures. A number of tasks are envisaged.

- a. **Engagement** – this will include a survey, scoping workshop and interviews (as necessary)s with the industry and particularly the target audience to obtain clarity on definitions, approaches, understand user experiences, their desired outcomes and explore the content and format of the guidance.
- b. **Review new and updated evidence and approaches** – Recognising the extensive information presented in the WWNP framework this will undertake a focused review of literature and initiatives both national and overseas that would be used in the development of the design framework and guidance on specific NFM measures.
- c. **Development of a scoping report** *– this will be split into three key sections including
 - i. Conceptual guidance that would include:
 - a) Clarification of definitions of NFM, and the measures,
 - b) An outline of the design framework, principles and design criteria for NFM delivery.
 - c) An overview of the NFM selection process
 - d) Initial guidance on overcoming delivery challenges
 - e) Initial guidance for the prioritised NFM measures – structured to support the delivery of NFM design criteria, and the lifecycle of the delivery process.
 - ii. Overview of the outcomes from engagement activities and the representation of additional evidence outlining any significant updated evidence and practice and the case studies that will be used. This would also be focussed on updated evidence relating the prioritised NFM measures.
 - iii. Content, structure, format and navigation of proposed guidance including information on case studies.

** This will be a two stage process. The PSG and reference group will provide early input on a draft of the conceptual guidance (with an example of one NFM measure). Comments will be received; a consultation workshop will take place with the reference group. These comments will then be fed into a Stage 2 report which includes the complete conceptual guidance and items ii and iii.*

2. PHASE 2 – drafting and development of guidance

Using information from WWNP and Phase 1 of this project two complete drafts will be developed before final editing and production of the outputs. The PSG will be involved in providing input and reviewing outputs and there will be a workshop to test the guidance by practitioners (outside of the PSG). Where possible opportunities will be sought to test the guidance on relevant project.

3. PHASE 3 – dissemination

CIRIA will work with project partners and the PSG to disseminate and champion the outputs. The provisional budget will allow for two webinars and a workshop to disseminate the guidance to a wide audience.

The programme has been designed to maximise engagement, consultation and dissemination of information from the project through a variety of communication channels.

Key requirements of the project team

The project team will be selected through a competitive tendering process and managed under a lump-sum contract by CIRIA with input from the PSG. Key requirements and skills of the project team are likely to include:

- **Familiarisation with UK and overseas NFM delivery** – proven familiarisation and contacts with those planning, designing and constructing NFM in the UK and also where possible overseas.
- **Practical NFM delivery experience** – proven experience in NFM delivery at a range of scales (with named examples) and include sufficient input from those disciplines involved in delivering NFM projects (ie engineers, land/landscape managers and those involved in engagement).
- **Experience of writing guidance** – experience in producing collaborative guidance for the target audiences and demonstrate consideration of where and how the outputs will be used. Resources and skills within the team should demonstrate consideration of presentation of information in an imaginative, graphical and useful way. There should also be a demonstrable appreciation of the opportunities and challenges of producing collaborative and consensus based guidance.

Project information

The total project cost is circa £180,680.

Phase 1: Mobilisation and scoping	£76,320	(9 months after project start (1 st PSG meeting))
Phase 2: Guidance development	£89,275	(21 months after project start)
Phase 3: Dissemination	£15,085	(22 months after project start)

Benefits of involvement

Funding the project provides an opportunity for your organisation to be represented on the Project Steering Group. This provides early access to good practice emerging from the project and enables you to influence and steer the independently chaired group. Involvement in the PSG also provides an opportunity to network with peers and raise your profile and promote your organisation's commitment to good practice amongst peers and clients (through inclusion of logo on outputs).

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