Tackling the barriers to implementing natural flood management

Summary Report

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at the Edinburgh Centre for Carbon Innovation

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Executive Summary

Natural flood management is a relatively new concept and includes a suite of features designed to slow the flow of water and store water in the landscape and on the coast. The concept has received some high level policy support, however, it is not as widely implemented as it could be. Understanding exactly when and how to implement natural flood management is challenging.

On 11th of February 2016, the James Hutton Institute brought together 27 experts (researchers, practitioners, NGOs and policy-makers) to discuss barriers to NFM. This concluded a period of research by the authors of this report into the barriers to implementing NFM; the meeting was intended to spur conversations about how to tackle those barriers or challenges. This report summarises the ideas discussed at that meeting.

It was agreed that a variety of barriers challenge attempts to enable and implement NFM including;

- Difficulties accessing funding and resources,
- Constraints of place & infrastructure,
- Gaps in evidence base,
- Formal and informal expertise,
- Discomfort with new approaches,
- Challenges of collaboration,
- Statutory processes, planning & appraisal systems,
- Difficulties in working over the long-term.

These encompass quite tangible issues such as misfits in planning timescales, through to rather less tangible issues such as NFM being outside the "comfort zone" of many. The interaction of these multiple barriers reinforces the challenge of enabling and implementing NFM. For example gaps in the evidence base for NFM can exacerbate the challenges of accessing funding for NFM.

Several ideas were shared for tackling these challenges;

- Finding new means to pay land-managers for installing NFM measures such as providing funding for sustaining land use that provides flow attenuation or water storage. There is a strong desire to improve access to resources that will not only fund installation of new measures, but that will also allow maintenance of measures.
- Reforming farm payments under CAP could encourage implementation of NFM measures. However, the 'rules of the game' for CAP are set in Europe so changes here will mean that the UK government must lobby for change in Europe, and evidence will be needed to strengthen its case.
- Building our understanding of the other multiple benefits that these measures may deliver (e.g. for biodiversity). Long timescales may be needed to fully understand how NFM measures affect flood attenuation, but their effects on other goals (or other ecosystem services) may be demonstrated sooner. 'Selling' these types of measures in terms of these other benefits can then help to engage and persuade new audiences.
- Developing and supporting intermediaries to support collaboration and communication. In some cases this may entail creating new organisations or partnerships, in other situations existing bodies can be used. It is important not to assume that all partnerships will be willing and able to fulfil this role, or indeed are seen as trusted neutral arbiters.
- Collecting more evidence about the effects of NFM measures not only to justify the approach, but also to inform effective delivery. This requires an understanding of how different measures work in different types of catchments. The information could be

collected from existing and new installations of NFM measures. In the meantime, there are opportunities to improve understanding by connecting and synthesising existing data, and by developing new approaches that allow upscaling of models.

- Consider tailoring access to funding according to the results of democratically-created regional or catchment-based plans. For example, Scotland's Regional Land Use Pilots illustrate how to capture preferences for ecosystem service delivery, which may tend to encourage implementation land-uses and management that tends to support NFM. However, to enable NFM, these outputs must be connected to other processes, sanctions or subsidies.
- Ensuring attention is balanced across upland, lowland and coastal NFM measures (rather than, say, focusing just on measures install in rural uplands) in order to best reduce flood risks and reduce coastal erosion.

These points identify steps needed to support and enable NFM throughout the UK. Some of these challenges and ideas echo issues identified in the past. For example, accessing funding remains a perennial challenge. Other ideas suggest a change in emphasis or in specific needs. For example, important progress has been made in modelling and mapping, entailing new priorities for improving modelling and evidence base. Further work will be needed to detail the exact actions required. In future, it will be important to revisit and update these priorities to reflect the fast-changing policy context and exciting new developments in the evidence base on NFM.

Acknowledgements

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Glossary

CAP	Common Agricultural Policy
CAR	Controlled Activities Regulations. Activities regulated by SEPA under the Water Environment (Controlled Activities) (Scotland) Regulation.
CBA	Cost-Benefit Analysis
DARDNI	Department of Agriculture and Rural Development Northern Ireland
EA	Environment Agency
ECAF	Environmental Cooperation Action Fund. Part of the SRDP from 2015
EFA	Ecological Focus Area. 5% of agricultural that must be set aside under CAP rules.
FCRM	Flood and Coastal Erosion Risk Management
FD	Floods Directive
FPO	Flood Prevention Order
FRM	Flood Risk Management
GAEC	Good Environmental Agricultural Condition, required standards to receive CAP payments under Cross-Compliance
GI	Green Infrastructure
Glastir	Welsh Rural Development Programme, part of CAP (equivalent to SRDP & RDPE)
HLF	Heritage Lottery Fund
H2020	Horizon2020, The EU Framework Programme for Research and Innovation
LA	Local Authority
LUS	Land Use Strategy
NFM	Natural Flood Management
NFR	Natural Flow Regime
NFRM	Natural Flood Risk Management
NFU(S)	National Union of Farmers (Scotland)
NRW	Natural Resources Wales
PES	Payments for Ecosystem Services
SEPA	Scottish Environment Protection Agency
SFM	Sustainable Flood Management
SGRPID	Scottish Government, Rural Payments and Inspectorate Directorate
SLE	Scottish Land and Estates
SRDP	Scottish Rural Development Programme, part of CAP (equivalent to Glastir & RDPE)
SuDS	Sustainable Drainage Systems
WFD	Water Framework Directive
WWNP	Working With Natural Processes

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1. Introduction to the workshop and this report

Natural flood management (NFM) is a suite of features such as tree planting, storage ponds and leaky dams, designed to slow the flow of water and store water in the rural and urban landscapes, and on the coast. It is a relatively young concept, and can be seen as part of a new approach to sustainable flood and coastal erosion risk management, which seeks to complement and go beyond a reliance on heavily engineered flood defence structures. NFM has received some high level policy support, particularly in Scotland, and is also supported by many organisations connected with water and catchment management.

Definitions of NFM vary (as does the terminology – for example, Working with Natural Processes is a similar idea) – instead of detailing a precise definition, this report encompasses the wide suite of non-traditional 'natural' measures that provide complements and alternatives to hard-engineered measures. NFM includes measures installed in urban, estuarine, coastal and rural locations; however discussions often focus on upstream rural locations, and hence require the engagement of rural land-managers.

Understanding exactly when and how to implement natural flood management is challenging. The objectives of the workshop were therefore to share experiences of NFM in order to:

- Review the barriers to natural flood management
- Share ideas about practical steps for overcoming them.

The organisers invited participants from a range of sectors, in order to bring together a range of experiences from individuals who already had some experience of NFM. Twenty seven people attended the event, from across the UK. Participants came from the public sector (both policy making and statutory agencies), private sector (mainly consultants), third sector, and from research organisations. See Annex 1: Participants list for a list of attendees.

This report provides a brief overview of the ideas presented and discussed during the day. The report broadly follows the order of the agenda (the agenda can be found in Annex 2). The Feedback from the participants from the day can be found in Annex 3.

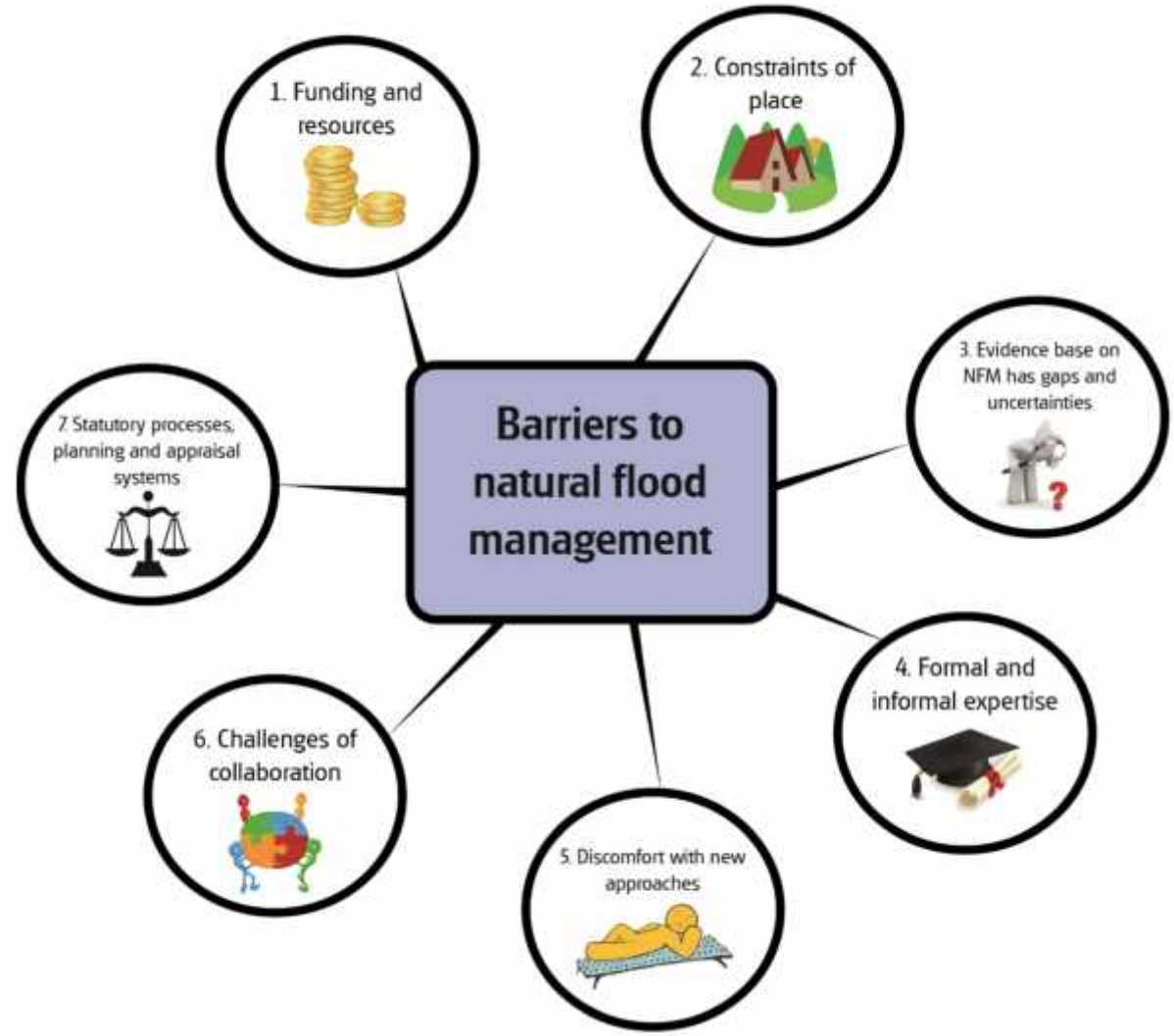
2. Describing and refining barriers to natural flood management

The workshop began by discussing and agreeing the barriers or challenges facing implementation of Natural Flood Management. The barriers had been identified by a research project conducted by the James Hutton Institute (led by Kerry Waylen with Kirsty Holstead, Kathryn Colley and Jon Hopkins). Details of this project are available at:
http://www.hutton.ac.uk/research/projects/exploring-barriers-natural-flood-management

The barriers identified by this research were described in a presentation to participants. The slides of this presentation are available from the above website.

Figure 1 on the next page summarises these barriers. Many of the issues are overlapping and interconnected. Table 1 shows more detail about specific issues that have been grouped under each barrier. These barriers were synthesised by the research team as a result of their review and research interviews. This table and diagram were used as inputs to the workshop process. These were used as a basis for discussions during the day: the first activities of the day involved commenting to check and improve these barriers.

Figure 1: Barriers to natural flood management (NFM) as presented by the workshop organisers



An academic paper that explores these barriers, by Waylen et al, is in submission with the Journal of Flood Risk Management. If and when this paper passes peer review, a link to it will be available, together with this summary report, and other outputs from our research on our project website at http://www.hutton.ac.uk/research/projects/exploring-barriers-natural-flood-management.

More detail about specific issues associated with each barrier is available as a table at the start of Annex 4. This table was synthesised by the research team based on their interviews with those enabling and influencing flood risk management in Scotland. Workshop participants pointed out that some of these perceptions may not always match with reality, particularly with respect to statutory processes.

After the research team had presented how they understood the main barriers, participants commented on how they understood and experienced barriers to NFM.

There was general agreement that all of the barriers were creating challenges for implementing NFM.

Three barriers stood out as being very important (see table 2). Funding and resources; Gaps in evidence base and Challenges of collaboration

There was also an 'other barriers' poster where people could stick ideas on other issues they felt were not represented. One of the most important barriers which came out of this was the 'Maintaining features in the long-term'. The difficulty of sustaining work over the long-term is a key issue that connects to or explains many other issues.

Other challenges noted related to aspects of the main barriers, plus a general challenge of not "over-selling" NFM during our efforts to persuade new groups that NFM is worth consideration.

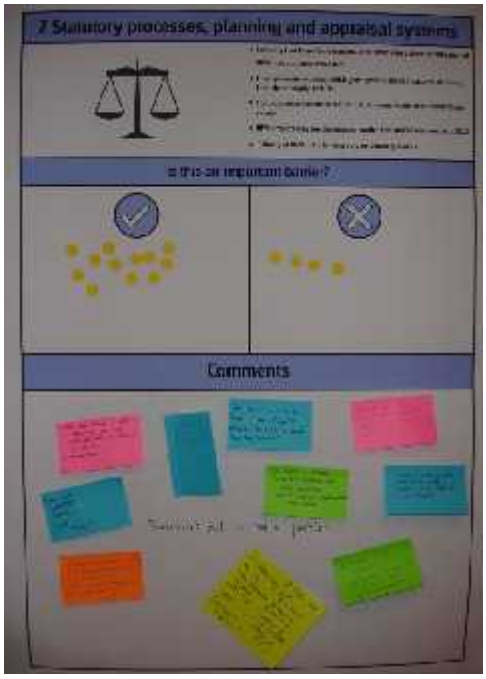


Figure 2: Participants used 5 stickers to vote for the barriers that they found most important (or thought were not). Stickers could be spent as pleased to reflect the perceived level of importance. In addition, comments were recorded using post-its. The results of the vote are noted in Table 2. Details of the comments are contained in Annex 4.

Table 2: Results of vote 'which barriers are most important for you?'

Barrier	This is important	This is not important
1. **Funding and resources**	●●●●●●●●●● ●●●●●●●●●● ●●●●●●●	
2. **Constraints of place & infrastructure**	●●●●●●●●●●	●●
3. **Gaps in evidence base**	●●●●●●●●●● ●●●●●●●●●● ●●	●
4. **Formal and informal expertise**[1]	●●●●●●	●●●
5. **Discomfort with new approaches**	●●●●●●●●●● ●●●●●	
6. **Challenges of collaboration**[2]	●●●●●●●●●● ●●●●●●●●●●	●●
7. **Statutory processes, planning & appraisal systems**[3]	●●●●●●●●●● ●●	●●●●
8. **Other barrier: Maintaining features in the long-term**	●●●●●●●●	

[1] Some felt that training and experience of engineers was not a key issue.
[2] Two comments noted that engagement is not a barrier, rather, the right person with wide experience and understanding is needed to work with others in implementing NFM.
[3] Participants noted that some of these challenges may be perceived but do not actually cause problems. Some felt for example that the Reservoirs Act was not a barrier, and pointed out that the Flood Protection Schemes process can be used to implement NFM.

3. Natural flood management in the context of policy changes

Heather Forbes (Senior Policy Officer, SEPA) detailed SEPA's progress in developing Flood Risk Management strategies as they move from development to implementation. Below are the key points from her presentation:

The Flood Risk Management Act is a new vision for Scotland built on a risk-based, sustainable and plan-led approach to managing flood risk, which is delivered at the catchment scale. It focuses on managing sources and pathways of flood water and involves improved public investment to protect people and property.

Natural Flood Management is part of this. For example it is included under section 20 where SEPA must identify whether NFM could contribute to the management of flood risk, and under section 28 where SEPA must consider NFM when setting objectives and identifying actions to manage flood risk in Potentially Vulnerable Areas.

Flood Risk Management strategies have been developed by SEPA to improve understandings of flooding, outline agreed objects and show targeted and prioritised actions. In this process NFM was considered, through mapping to show where NFM could potentially reduce flood risk and through a technical appraisal to consider land cover and flood risk information. In total 106 actions incorporating NFM studies or works were identified.

The priorities identified by this process include 10 flood protection schemes that incorporate NFM elements (from a total of 42 prioritised schemes). There are also 4 NFM-only works. In addition, this work has identified 69 flood protection studies that include NFM measures (from a total of 134 studies), alongside 23 standalone NFM studies. These schemes and studies will be prioritised during 'delivery cycle 1' running from 2016 to 2022. The next step in this process will be Local Authority delivery plans that are due to be published in June 2016.

Lydia Burgess-Gamble (Environment Agency, England), Duncan Huggett (Environment Agency, England) and Jacques Sisson (Natural Resource Wales, Wales) gave short reflections about their experiences of working with NFM elsewhere in the UK.

Lydia noted that in Scotland NFM is included in policy to a greater extent than in England. The Environment Agency (EA) are doing research to help teams who want to do NFM and have several projects such as a report on how to model NFM schemes, backed up 20 cases to be published in March 2016. They are also aiming to pull together all of the scientific evidence to help make the case for NFM (and to identify important evidence gaps) and plan to make opportunity maps for where NFM could reduce flood risk. Lydia reported that the NERC and EPSRC have tentatively said yes to funding demonstration catchments, with SEPA as a supporting partner, so there may be potential for new demonstration site(s), across the UK.

Duncan talked about the huge risk of flooding in England. He said that there are evidence gaps which are a major barrier to installing NFM in England because they need to be able to prove the level of protection delivered. On top of this it is challenging to work across a catchment scale and to understand the effects at a large-scale. In England community engagement is a big challenge because most people choose or prefer hard engineering measures to protect themselves from flooding. He proposed that it may be useful to reframe communications about NFM - it is not about keeping water out of the landscape, it is about deciding where to put it.

Jacques noted that in Wales many of the challenges relate to accessing funding for NFM. Uptake of Glastir (the sustainable land management scheme, through which we offer financial support to farmers and land managers) is usually poor, often because it is seen as complicated. Natural Resource Wales aim for Glastir to be better tailored to favour NFM measures. Aside from this, the new Environment (Wales) Act will encourage taking an 'innovative approach', which may favour NFM. Work by SEPA and EA helps motivate Wales to take action!

These contributions illustrated some important differences in the policies and institutions that influence NFM in different parts of the UK. However, the strongest message was that the UK-wide aspiration to better understand and implement NFM creates opportunities for collaboration. This was an important reminder that experiences and learning should be shared across borders.

4. Tackling the barriers to natural flood management: practical steps for overcoming barriers

After confirming the barriers and adding the additional issue of working in the long-term, participants discussed practical solutions for overcoming them.

First, everyone brainstormed all possible ideas they had for addressing barriers, writing these on post-its that were stuck by each barrier. All these actions can be found in Annex 5.

Small group discussions were then used to further elaborate those actions associated with the most important barriers: 'funding and resources', 'challenges of collaboration', 'gaps in evidence base' and 'working in the long term'.

Each group was asked to develop an Action Plan to address one barrier. These discussions were informed by the post-its of the prior brainstorming session to which everyone had contributed: after synthesising and refining these ideas, each group then discussed needed to be done, how, by whom and when. The four subheadings below list the results of each group's discussion. However, it is important to note that these are not fully-developed action-plans: several actions or issues require more discussion. A summary of each group's discussion is listed below – a more detailed action planning table for each group is also available in Annex 6.

Overcoming barriers: Money and resources

In the past few years some progress has been made in making resources available to NFM schemes, for example Local Authorities are now able to spend a proportion of their capital grant available for non-scheme work including NFM, and the Scottish Government has provided guidance on determining compensation payment rates.

The group's discussions centred around the existing system of farm payments. They thought that NFM could mean a loss of income for farmers and land managers, making it unattractive, however adapting payments could make NFM more financially viable. Some were critical of this logic, proposing that a big question remained - should famers be paid for land management activities like NFM that reduce flood risk? It was decided that in some cases, it was appropriate that farmers be paid for the delivery of ecosystem services such as flood protection. The group agreed that farm funding mechanisms need to be appraised and aligned to support NFM.

Action 1: Pay farmers to install or host NFM features[4]
What? Pay farmers/land managers for hosting NFM measures on their land (via either a PES scheme or a flood risk management scheme integrated though current farm payments).
How? Could involve and land based assessment to look at land type and capability for storing water. Payment would occur only when land was flooded.
Who? Farmers are obviously key actors to involve, but do we understand what farmers want? How do they want to be paid and in which circumstances? Some research has already been done on this area but more is required to understand how it would be done and what is attractive for them. Some farmers or land managers prefer to 'farm' rather than be paid for storing water on their land – this is difficult to tackle through payments alone.
When? As soon as possible - without the payments, farmers/land managers cannot afford to store water on their land. NFM must include a long term payment as it can lead to irreversible land use changes.

Action 2: Pay farmers for water storage (and other services)
What? Pay farmers/land managers to store water on their land though integrated land management plans or 'mini land use strategies' at the farm level.
How? This bottom up farm scale planning would involve farm scale mapping to look at the types of benefits that land could provide. This service provision would then be aligned with existing funding mechanisms.
Who? Farmers and public need to be engaged. Benefits have to be tangible, visual and measurable so farmers and the public can see them, but also so that we know we are getting value for money.
When? We are a long way from this happening at a national scale. There needs to be some proof of concept first in the form of examples or demonstration farms.

Action 3 (incomplete): Reform CAP
What? Remodel the CAP system.
How? The outputs supported by /aimed for by CAP should be quantifiable; we need to be able to measure the benefits that it delivers. To do this outputs need to be measureable, visible and accountable – it has to be clear what services are being provided, and by who. This is for the farmers

[4] There already some changes that can support for NFM. Under the 2014-2010 CAP cycle, it is possible to afforest farmland without losing the 'Basic Payment' provided to farmers. This means a farmer could afforest eligible floodplain land and still get basic payment revenue. For more information about this scheme works in England, see https://www.ruralpayments.org/publicsite/futures/topics/all-schemes/forestry-grant-scheme/woodland-creation/

so they can see what they are delivering, but also for the public and those who administer the subsidy.
Who? Unclear – more discussion needed. Who would measure it, whose responsibility is it to measure these things and how would it be done? How do you put this monitoring in place and is it possible at the farm level scale? It then becomes difficult and resource intensive and less likely to happen.
When? Now!

Overcoming barriers: Challenges of collaboration

This group discussed the importance of trusted intermediary bodies. They thought this was the most effective way to encourage collaboration.

Action 4: Develop and support intermediaries
What? Develop trusted intermediary bodies. They would keep track of different projects going on in their catchment, facilitate communication and integration, link different stakeholders concerns (flooding, pollution, biodiversity, etc.) and increase external credibility. A big function for intermediary bodies would be to keep track of many different projects that go on in single catchments. This would allow increased communication and integration between different projects.
How? Intermediary bodies could be funded by partner organisations to pay for staff costs. Having someone in a co-ordinating role that is able to develop good relations with stakeholders (e.g. land managers) is key. Staff costs are the main thing for which funds are required for. Intermediaries need to be charismatic and have good stakeholder engagement skills. The Environment Agency ideas of catchment managers could maybe be a model for Scotland?
Who? The partners that need to be involved are SEPA, Local Authorities and local land managers and owners. The Forestry Commission Scotland and Scottish Water are potential additions. The high concentration of land ownership makes collaboration very dependent on engaging landowners. This requires significant stakeholder engagement skills.
When? Developing trusted intermediary bodies is a long process with no certain timetable. Opportunities to start new intermediary bodies could come top-down from SEPA, or from a collection of bodies (as is currently happening in the Borders), or from re-purposing existing bodies (Fisheries Trusts).

Overcoming barriers: Challenges of evidence base and uncertainties

The group acknowledged that the evidence base around NFM is still developing. They thought that although a good knowledge existed at local scales, less was known about the impacts of NFM at larger or catchment scales.

Action 5: Set up more monitored demonstration sites
What? More monitored demonstration sites are required. Existing sites should be kept running – long term datasets are essential to detect catchment, but also new monitored demonstration sites which fill the knowledge gaps around existing monitored demo sites are required, for example there are few NFM example catchments which are located on Chalk catchments.
How? Funding is required and could be provided by a range of bodies for example by Research councils, or the EU though H2020.
Who? A lot of activity has already started relating to this (EA 'Working with Nature catchment laboratories project' and Scottish Government 'Building with Nature' project. A key question remains – how do we bring this fragmented research together? (see Action 6).
When? Yesterday! The baseline datasets are required before interventions are installed in catchments.

Action 6: Synthesise existing data
What? Synthesis and analysis of existing data is needed. This could help answer a further question around knowing how much monitoring is required.
How? This is interlinked with action 5 as it needs funding from the same sources.
Who? Needs statistical tools and models – maybe some new tools (see action 7). Need to gather the information somewhere, e.g. a web based resource–a cloud tool (link to action 8)
When? Now

Action 7: Upscale modelling
What? Modelling tools are needed to upscale – need some bespoke or new tools to address these challenges e.g. which models and how do you integrate knowledge from action 5.
How? Same points as above
Who? Similar points to above. EA have just completed a modelling framework that will help
When? Linked to above

Action 8: Improve tools for communication and visualisation
What? We need new communication tools. These could be: virtual catchments, web based resources, data/modelling syntheses, communication of uncertainty, mapping the impact of NFM, mobile phone apps to visualise flooding. This is important because we need to have a cloud based platform which allows everyone to be able to access data, resources, outputs around NFM. We should try to develop 'Virtual' catchments – i.e. virtual places whereby landowners could virtually develop NFM measures on their farms (kind of like a kitchen design app).
How? Would require the computer science community.
Who? Would require a big leap forward in detailed visualisation modelling but would offer holistic/multiple benefit approach.
When? Soon.

Overcoming barriers: Challenges of thinking in the long term and assigning liability

This group discussed topics around how to deal with liability and also how to work in the long term.

This issue had arisen out of the previous interactive session reviewing and refining the barriers. In discussion the group agreed issues of working in the long term and liability were connected but that liability was a distinct concern that could be relatively easily dealt with by clearly communicating to land-managers that they will not be liable for unintended consequences of NFM measures, and specifying implications for liability through any contracts. Further discussion about liability centred on controlling risks of unintended consequences of installing woody debris by extending the evidence base, risk assessments and controls, and careful selection of sites.

Having addressed issues around liability, the group went on to focus on working in the long term in the action planning task. Several of these actions overlap with or reinforce actions identified by the other three groups.

Action 9: Fund maintenance of land use that provide multiple services
What? Provide long-term funding for actions and land-uses that maintain and provide multiple benefits (this may include paying to guarantee flow attenuation, even where no new maintenance measures are required).
How? Through CAP reform to incentivise management for ecosystem services and by allowing CAP subsidies to

be allocated on the basis of regional Land Use planning (see Action 10).
Who? Requires action at a national level (UK or Scotland) to work with other stakeholders to lobby the EU commission, and meanwhile to adjust payment rates within current rules.
When? ASAP and targeting next CAP reform.

Action 10: Democratically create regional plans for prioritising land use
What? Re-democratise land-use planning e.g. through Regional land-use plans.
How? Roll out Regional Land Use pilots more widely and ensure the LUS Action Plan is comprehensive and implemented. Use to inform CAP subsidies.
Who? Local Authorities or regional land administrations
When? Consider how to strengthen the LUS as soon as possible.

Action 11: Support long-term monitoring
What? Long-term monitoring of flood measures (both in terms of their effects on flows and other multiple benefits)
How? Knowledge collection and sharing between all knowledge holders and scientists. Long term monitoring can be expensive and may need to better prioritised by funders who have limited resources or budgets available only for capital costs.
Who? Academic organisations, student MSc and PhD projects
When? Monitoring needs to be planned before projects start

Action 12: Give more attention to coasts
What? A long-term plan for adapting the coast (including NFM) is needed
How? Developing better understanding of coastal change and using this information to plan and prioritise actions
Who? Government should lead
When? Information needs to be collected before a plan can be made.

Word cloud of comments generated during brainstorm of required actions.

Synthesis and reflections on actions to prioritise

Some of the actions prioritised are more tractable than others (e.g. improving communication is easier to plan than reforming the CAP). However, it is important to note that both the barriers and the actions identified are interconnected and overlapping. It will be important to consider these connections in order to aid us in prioritising and addressing the challenges.

Firstly, several actions relate to funding for installing and maintaining NFM. There is a strong concern to improve access to funding that will not only allow installation of NFM measures, but that also allows maintenance of these measures - or simply safeguards maintenance of a land use that provides flow attenuation services. Some have concerns about whether farmers should be paid for any service they provide from their land, effectively questioning the balance of rights and responsibilities that should be apportioned to land-managers. However, regardless of views on where this balance lies, there is strong agreement that the CAP system requires reform. At present national governments have some ability to alter payment rates and schemes to enable NFM. For example, in Scotland SEPA and the Scottish Government are working to make agri-environment schemes (SRDP) better fit with NFM delivery and compensation. However, the 'rules of the game' are set the European-level. Therefore action is also needed by the UK government to lobby for change in Europe, and evidence will be needed to strengthen its case.

Secondly, there still is a clear need for more evidence about the effects of NFM measures. Evidence is needed to help understand and justify the NFM approach, but also to enable effective delivery – e.g. to select and design specific measures in different locations and catchment types.

This will require more information to be collected from existing and new installations of NFM measures. New sites must be designed to collect baseline data so as to allow for before and after comparisons (these are usually called demonstration sites – but it was suggested that this label can act as a deterrent, implying NFM to be unduly unproven and experimental). In the meantime, there are opportunities to improve understanding by connecting and synthesising existing data, and by developing new approaches that allow upscaling of models. NFM is often seen as suitable for small-scale floods in small catchments but this is partially because the effects on larger scales are less well understood. The question of scale also extends to timescales – long-term monitoring is essential to deepen our understanding on effects on flows.

Given the timescales that may be needed to fully understand effects on flood attenuation, it may be useful to improve our understanding in terms of the other multiple benefits they deliver (e.g. to biodiversity). Ultimately, 'selling' these types of measures in terms of other benefits may be important for persuading and engaging new audiences.

Supporting collaboration and sustained communication on NFM are two connected and essential topics. This is often not perceived to be a strength of public agencies; regardless of whether this is true, they may face a legacy of distrust or disengagement. The idea of 'trusted intermediaries' is therefore seen as critical. Therefore, much of the discussion at this meeting focused on how to support, enable and encourage these intermediaries. This usually entails supporting third sector organisation (NGO) but it is unclear whether new organisations need to be created, or existing organisations and partnerships can be used. It is important not to assume that all partnerships will be willing and able to fulfil this role, or indeed are seem as trusted neutral arbiters. Specific arrangements will probably be specific to each catchment, but to support this it could be useful for research to identify different potential "recipes" for collaboration, and their implications. By contrast, recommendations on best practice in communication seem relatively well established, i.e. that we target messages to different groups, and seek to engage in dialogue rather than seeing

communication as a one-way of information. Understanding role of new and existing tools (e.g. for visualisation) to support this dialogue is a new and existing topic for exploration.

The role of visualisation tools may be particularly important if we seek to develop regional or local plans for land use. The example of Scotland's the two Regional Land Use Pilots[5] shows us how it is possible to work with people to discuss possibilities for land use and identify aspirations for ecosystem services. Here, a variety of approaches to presenting ecosystem services, including models and maps have been used. These Pilots give a useful example of how to go about involving people in planning and priority-setting in other areas. However, by themselves, replicating the Pilots will not enable changes in land use to support NFM and other services. It is essential that their outputs are able to feed into influencing land use and other interventions. One idea is to allow RDP subsidy options that can be accessed in a particular place to be tailored as per to the results these Plans. In Scotland, there were calls for the parent Land Use Strategy to 'be strengthened' or 'given teeth'. This might even entail allowing sanctions and subsidies to be directly attached to the Land Use Strategy, or connecting its recommendations with other Legislation such as on Land Reform.

Nearly all of our discussion at this meeting focused on managing freshwater catchments to reduce fluvial flood risk. We did not discuss coasts: however we need to better understand and manage coastal flood risk. There is some ongoing work on coasts: until we better understand coasts and coastal flood risk it is difficult to identify any other actions on this topic.

Lastly, our discussions mostly did not differentiate between different NFM measures. However, one might reasonably expect the issues associated with re-meandering to differ from, say, installing buffer strips. At present it is possible that we simply lack the evidence and experience to differentiate between the challenges associated with different measures. As we collect more evidence from demonstration sites and develop our thinking about challenges, we should remain alert to the possibility that different approaches may be needed to enable and sustain different NFM measures.

[5] http://www.gov.scot/Topics/Environment/Countryside/Landusestrategy/regional

5. Conclusions

Overall, the objectives for the workshop were met. However, it was often easier to talk about what needs to change than to identify exactly what needs to be done, showing that more attention to this topic is needed to allow NFM more widely practised.

Five years ago a SNIFFER workshop[6] captured ideas about enabling implementation of NFM. Given the accumulating experiences of NFM, plus the fast-changing policy context (see section 3), it is timely to reflect if and how priorities for actions have changed over this time.

In 2011 the discussions were focused around four topics: establishing how to design a project; proposing a method to assess the potential contribution of NFM to managing flood risk; identifying correct structures and support to deliver demonstration projects on the ground; and improving communications and attitudes to NFM. Plans to tackle these challenges focused on a new NFM handbook (recently launched in January 2016), providing methodologies and rules for Section 20 of the new Act (now established) and targeting communication to a variety of actors, linked to the SAIFF communications strategy.

It is heartening that many of the planned actions have been completed, for example progress has been made in establishing how to scope and model flood risk management using NFM. We also see signs that support for NFM may be strengthening –witness the discourses around the recent 2015-16 floods, versus previous flood events.

However, many of the same underlying issues seem to be persist e.g. the need for good communication. Furthermore, other issues now seem more important: for example, much of the discussions in this workshop had a focus on how to create opportunities to fund farmers to install or maintain NFM.

This workshop provides some new ideas about how to tackle these challenges (section 4). However, these ideas are just a starting point that will each require more development to ensure our future efforts are best directed. Furthermore, it is interesting to observe that some of the challenges relating to NFM arise from institutional issues such as mismatched timescales, the challenges of fostering new mind-sets, or enabling collaboration: however, much discussion was focused around the challenges of providing funding to farmers. Are there some types of issues that need more discussion in order to identify how to tackle them? As we strive to enable and understand NFM, it will be important to revisit all our actions and priorities.

If you are interested in finding out more about what is currently known about the barriers to NFM, Annex 7 lists the resources that informed this workshop.

[6] http://www.sniffer.org.uk/files/1913/4183/7992/NFM_Workshop_Report_Final.pdf Also in resources list.

Report Annexes

Annex 1: Participants list

Name	Organisation
Alan Werritty	University of Dundee
Alex Schlicke	Scene Consulting
Anne Grey	Scottish Land and Estates
Cameron Maxwell	Forestry Commission Scotland
Cathryn Spence	AECOM
Conor Price	Borders Council
Dave Gowans	Moray Council
Debi Garft	Scottish Government
Duncan Huggett	Environment Agency
Elizabeth Daly	RPA Risk and Policy Analysts
Grant Vanson	Scottish Water
Heather Forbes	SEPA
Helen Jones	Scottish Government
Jacques Sisson	Natural Resources Wales
Jim Densham	RSPB
Joshua Msika	James Hutton Institute
Kerry Waylen	James Hutton Institute
Kirsty Holstead	James Hutton Institute
Luke Comins	Tweed Forum
Lydia Burgess-Gamble	Environment Agency
Mark Wilkinson	James Hutton Institute
Michelagh O'Neill	Sniffer
Mike Strachan	Forestry Commission Scotland
Minni Jain	Flow Partnership
Nicola Colquhoun	Loch Lomond & Trossachs National Park
Paul Quinn	Arup
Peter Phillips	Collingwood Environmental Planning
Sarah Hutcheon	SNH
Steve Rose	JBA Consulting
Vincent Byrne	Aberdeenshire Council

Annex 2: Meeting agenda

10.00-10.30	**Registration and refreshments**
10:30-10:40	Welcome and Introduction
10:40-11:00	Presentation 1: *Kerry Waylen, Barriers to NFM in Scotland*
11:00-11:40	Interactive session: *Confirming and consolidating the barriers to NFM*
11:40-12:30	Presentation 2 and discussion: *Heather Forbes, An update on SEPA's Flood Risk Management plans*
12:30-13:15	**Lunch**
13:15-13:45	Plenary brainstorming: *Brainstorming actions to tackle the barriers to NFM*
13:45-14:45	Small group session: *Refining ideas for action planning*
14:45-15:30	Plenary discussion: *Summarise contributions and identify next steps*
15.30-16:00	**Close, networking and refreshments**

Annex 3: Feedback on the workshop

All participants were asked to fill in a feedback form. In total 12 were returned. Those who returned the forms thought that the meeting was 'useful' (5 of 12) or 'very useful' (7 of 12). People reported learning a range of things from the workshop and it was also seen as a valuable event "to share knowledge and experience to inform debate and identification of plausible actions to overcome barriers" and because it was "useful to pick up ideas and approaches and to identify solutions." The feedback suggested some additional ideas for enabling implementation of NFM that had not already been discussed during the day for example a form of NFM hub to share knowledge (e.g. good/best practise and case studies) and experience could be valuable. Overall, there was a high level of satisfaction with the structure of the day and facilitation.

Annex 4: Comments on barriers

The table below lists specific issues associated with each barrier in figure 1 (see section 2 of this report). This table was presented and synthesised by the research team based on their interviews with those enabling and influencing flood risk management in Scotland. Workshop participants were then invited to comment on these barriers and issues. The following pages record all participants' comments. These highlight that some of the issues perceived by interviewees may not actually exist, particularly with respect to statutory processes.

Barrier	Specific issues acting as a barrier as identified by interviewees
1. **Funding and resources**	) Lack of resources available specifically for NFM installation) Lack of resources to fund staff time for collaboration, coordination and engagement with other stakeholders) Mismatches in funding and planning cycles by different partner organisations) Payments - for maintenance and/or land-manager compensation - may need to be made in perpetuity.
2. **Constraints of place & infrastructure**	) Difficult to plan work across larger (sub)catchment scales) Some river systems or parts thereof (coastal, urban) are perceived as unsuitable for NFM) Need to protect and work around legacy of existing infrastructure (bridges, roads).
3. **Gaps in evidence base**	) Uncertainty as to how to design NFM measures) Evidence gaps on effectiveness of NFM measures) Worries about possible unintended consequences of NFM) New and complex models required to plan NFM) Perception that NFM may 'only' be useful for small flood events or climate change adaptation.
4. **Formal and informal expertise**	) Engineering training and backgrounds predominate) Lack of familiarity or practical experience with NFM) Partnership working and/or stakeholder liaison not a skill.
5. **Discomfort with new approaches**	) New multiple measures appear more complex and ability to deliver them is less certain) Public pressure may favour 'hard' structural measures) Time lag between installation of measures and being able to demonstrate their effects.
6. **Challenges of collaboration**	) Need to work with other partners at multiple levels) Need to coordinate within large organisations) Need to coordinate installation of multiple measures) Difficult to engage, persuade and coordinate land-managers) Diffuse and occasionally unclear accountability and responsibilities) Some 'plan districts' cross boundaries of multiple local authorities.
7. **Statutory processes, planning & appraisal systems**	) Statutory Cost-Benefit assessment procedures rarely seem to allow prioritisation of NFM over structural measures) Flood prevention orders, which give rights to install measures on private land, are perceived not to apply to NFM) Requirements to reduce risk of severe floods over smaller flood events) NFM projects may need permission under the Reservoirs Act) Delivery of NFM not a binding duty on statutory bodies.

The contents of this annex are copies of comments in post-its placed on posters of each barrier. Initially there was no further structure to this open brainstorming: any subheadings within this table represents grouping or synthesis carried out later in the day.

	Barrier	Comments on barrier
1.	**Funding and resources**	Farm payment comments: • Need for actions though the SRDP. If completed though SRDP then onus to maintain is written into contract. • Progress has been made, ECAF/now SRDP payments but more to do • Funding often available for other ecosystem services, NFRM is a secondary/consequential outcome. • Long term maintenance and liability are important, but they are a subset of funding and resources. SRDP contracts help as they are trusted by farmers. Farmers are used to taking on liability through them. Only drawback is that they are only 5 years long. • Facilitate fund though Rural Development (Cap Pillar II) for catchment/landscape partnership working. • Resources – the Monbiot question. Why not pay land holders for the services we want such as NFM rather than the limited public benefit from £400million of basic farm payments. • Improved farm payments under SRDP where there are clear FRM benefits • Greater longevity of payments (e.g. covenants) Other comments: • Staff time more the issue • Once coordination and persuasion dealt with, funding is the next barrier • Limited budget to carry out full catchment modelling and hydrological surveys = major constraint. • We need long term funding of 'trusted intermediaries'. ECAF helps but longer term building of relationship needed i.e. Fisheries Trust • Maintenance is important. Life span of NFM features is undeterminable, who pays and who is liable? • Need to get much better at working out and promoting all the benefits of NFM and who the beneficiaries are. This is the biggest barrier in England. Using our existing government funding rules, it is hard to justify NFM because you need to show a reduction in risk to people and property which can be hard so it is hard to demonstrate costs and benefits.
2.	**Constraints of place & infrastructure**	• Need for critical mass and to get the right measures in the right place, at the right scale • Wider landscape scale approach is needed for coastal and firths for coastal NFM planning and implementation • Barriers to place relate more to accepting an integrated land use with no loss of farm income • Ability to implement in urban areas is determined by existing infrastructure • We need to demonstrate the NFM is effective at large scale ~ 200 km^2 • All evidence says woody debris is a good thing unless there is vulnerable/sensitive downstream infrastructure such as bridges/culverts. Are there any rivers where this is not the case?

	• Perception or lack of knowledge of benefits of NFM - coast and urban are important and possible • Blue and green infrastructure complement each other • If something is genuinely constrained then we should not plough on regardless. NFM is part of the broader FRM toolkit. • Need to protect and work around, or adapt, existing infrastructure (bridges, roads).
3. Gaps in evidence base	Need for longitudinal, long term and context-specific data: • Evidence gaps can only be filled by securely funded, long-term field experiments obtaining continuity of funding over (and up to 10 years) is challenging. But site specific – we need more (see Pontbren report for evidence). • Demonstration sites in a range of catchment types are required • Baseline monitoring prior to measure being implemented is crucial • Targeted monitored projects e.g. EA Catchment labs! Focused on NFM measures prioritised in strategies • Often not clear how to monitor measures to gain quantitative evidence Scale issues: • A knowledge gap is how do we scale up • NFM for BIG storms = NFM+ • The perfect case study to provide evidence at all scales for all NFRM measures is unlikely Can we deliver in the absence of certainty? • We may have to learn to work with "uncertainty" • How much evidence do we need? Can we live with uncertainty and deliver as no regrets? • Is it that we have the evidence and do not like the conclusion? • Need to focus on multiple benefits and press on while evidence catches up Need for evidence to demonstrate costs and benefits: • Hard to demonstrate reduction in FR to people and property • Flood risk managers need NFM to demonstrate the: 1) capacity of the environment to absorb water at any point in time 2) standard of protection any NFM scheme affords • To access funding we need the evidence to feed into cost-benefit assessments • Need evidence of other ecosystem services value, economic and social.
4. Formal and informal expertise	Mixed views on engineering training needs: • A little unfair on engineers and university courses! • Do engineers understand land management! Is this a problem with uni and colleges? • I think the training/ experience of engineers is less of an issue than the training of those who influence public perception of any FRM measure. For example, NFM being sold as something that can solve all flooding e.g. Storm Desmond reporting • Engineers have to understand lots of things - that's why they are

	engineers! Need for intermediaries: • Trusted intermediary with knowledge of NFM and land management and farming/forestry is key. [Another person added:] I agree! • Action: Develop training and tools to help people work across organisations or to facilitate connections between organisations (intermediaries) Other comments: • Lack of formal training in NFM within government bodies due to lack of funding - but still expected to deliver • Contractors often do not want to design or construct NFM due to professional liability around designing a scheme which may fail. • Who should take lead in community effort scheme? • Very variable between areas - useful to have base of advice/expertise more widely advertised/ available. • Same as Challenges of Collaboration barrier.
5. Discomfort with new approaches	• But can be addressed through evidence and communication/engagement • Lack of understanding by general public of what NFM can do and therefore they usually favour hard engineering over NFM • Need to convince Local Authorities to uptake NFM including: public, elected councillors, busy officials, engineers. • Upscale NFM and downscale FRM - new methodology • Time lag - how long does it take to get barriers in place? Perth Flood 1993, barriers by 2004! • How do we communicate these measure are not a silver bullet and will not stop flooding - expectations management.
6. Challenges of collaboration	• Landowner persuasion is a very individual thing. Need to understand what motivates individuals – can range from farming economics to shooting interest, to conservation or forestry or tourism. • There are NGOs/Third parties who can help broker these relationships successfully. People don't have to rely on doing it all themselves. Impartiality of these can be helpful. • Different parts of organisation have different priorities. • Landowner engagement needs breaking down further. Why are they not keen? Loss of income; loss of capital value; loss of flexibility; hassle; money. • Engagement is not a barrier – needs the right person with wide experience and understanding. • Could be an internal issues e.g. who does what in SEPA and do they speak to each other? • Engagement is not a barrier • This is also an opportunity! Bottom-up/collaborative approaches without reliance on regulation or subsidy. • Perception of the public and landowners is important. • In the context of no formal NFM – lead individuals in key organisations are critical – link to internal comms and prioritisation [privatisation?], e.g.

	SEPA, Local Authorities - Make/seize opportunities for frank discussions about how collaborations are strengthened. - In areas where SEPA has adopted a lead NFM role there is a need to better engage with parallel/linked initiatives. - Suspect that many Local Authorities Land manager stakeholders don't understand the flood risk management structure or strategies. Need to get basic messages of FRM across.
7. Statutory processes, planning & appraisal systems	Some of these perceived challenges don't actually exist: - I think some of these are perceived rather than actual barriers – need clarity. - Reservoirs Act is not a problem. - Can use FPO (Flood Protection Order) process. Also powers to maintain and take action against people damaging things. - You absolutely can use Flood Protection Schemes under the FRM (not termed 'orders'). FPS are huge (potential) source of funding and should include NFM (under the ethos of the Act). Aspects and examples of these challenges: - Difficulty in getting committee approval for local authorities – this is linked to lack of understanding and evidence. - Problems come from more than the Reservoirs Act – need planning consent, need designated site consent, comply with CAR (Controlled Activities Regulations), fisheries. - Funding calculations and processes. - Extent of evidence base required to identify a solution will be beneficial (16km^2 catchment). - Cross-compliance and a lack of an integrated approach to EFA & related benefits. - Government advocating NFRM but funding for measures is lagging behind. Often NFM is only a secondary purpose of funded activity. Other comments: - Where are SGRPID (Rural Payments and Inspections Directorate), NFUS (National Union of Farmers) and SLE (Scottish Land and Estates) today *[Comment from authors -SLE were present, NFUS were invited but declined]*

8. Other barriers	Need to get better at working over the long-term: • Maintaining features in the long-term • Maintenance of NFRM measures – who is responsible? Can we ask partners to take on responsibility in mitigation for other work? • For an NFM scheme to work it must be maintained in perpetuity. But how and by whom? Worries about liability can impede action: • Who decides liability? • Liability for dams/debris is not always clear – is it Government, Agency, or landowners? • Contractors cannot always design and construct these measures due to professional liability if NFM features fail. Need to work with new groups – links to barrier #6 on communication & collaboration: • No mention of the insurance industry? They require a high degree of certainty about the performance of NFM. • Need to change mind-sets – links to barrier #6 on communication & collaboration • Change of culture – make it pay!! E.g. remove livestock to reduce compaction • Dredging, dredging, dredging – mind-sets need changing Need to clarify expectations as to role of NFM? Links to barrier #6 on communication and collaboration, and may also link to barrier #3 - needs for evidence: • Is NFM fundamentally incompatible with efficient flood risk management which needs to store vast volumes of water over short periods of time and then get rid of it quickly in time for the next event? • Media has recently grossly inflated the contribution of NFM for mitigating impacts of recent floods. • Constraints of NFM not recognised by recent 'Landward' documentary – this will lead to additional consultation as information was misleading. Adds to current level of work implementation. This reduces time that would be better spent on identifying solutions. • Managing expectations as to urban flood risk reduction vs land-managers willingness to implement NFM. • Definition of NFM is very broad, from working with natural processes through to natural habitats. This affects collaboration, evidence, benefits and understanding. Need to change rules and policy – links to barrier #7: • Red tape and stupid rules. • Consistent cross-sectoral policy from government. Currently hearing mixed messages e.g. flood embankments, dredging. • Confused political leadership. Stewart and Truss saying NFM should be looked at. PM says days of balancing FCRM and environment are over!

Annex 5: Ideas for overcoming barriers

The notes in the table below are transcribed from ideas on post-it collected during the first afternoon session where the whole group brainstormed ideas for actions. A synthesis of these ideas, and further discussion as to who and how these actions could be implemented, is presented on page 11 onwards of this report.

Barrier	Actions identified to tackle barrier
1. Funding and resources	) Funding – a new funding model is required) More money for NFM) Align existing funding) Funding for feasibility stages – not just for implementation measures) Go to the EU with a solution, not a problem. Stop talking and start action) More and longer term ECAF funding) Private funding – social impact bonds) Multi stakeholder financial instalment) Need for research on what kind of payment mechanisms attractive to farmers – lots of options/economic instruments available) Money saved on insurance payouts?) LUS to guide integrated funding opportunities including NFM) Consideration of NFM/working with natural processes should be a requirement of all FD GiA [Grant in Aid] allocation) Develop a benefits calculator which allows quick calculation of value of all ecosystem services and economic, health etc. benefits of NFM elements of a scheme.) To get funding in England and waters a scheme has to be cost beneficial and demonstrate a reduction in FR to people and property. This makes it hard to justify NFM.) Sort out CAP!! Land managers with holdings over a certain size should be required to deliver desirable locally needed ES to qualify for direct payments.) Can fund though flood protection schemes) Identify sustainable funding solution) Alignment of relevant policies to ensure farmers not given conflicting triggers for action e.g. agri. and enviro. policies) Review funding framework including partnership funding calculator to facilitate proper integration of different funding sources reflecting actual beneficiaries.) Issues need to go up the political agenda to secure funding) CAP subsidies to pay for flood water storage on land) SRDP managed realignment option to pay for secondary sea defence construction) Alignment of different public and private funding streams required. SRDP could do more.) Funding – be realistic about role of NFM – its only one tool in our box. Sometimes it's a panacea) Develop a proactive approach to enable/empower communities to access funding for preventative measures, not just protection and remediation) EU funding rules) Funding issues generally relate to SRDP, then UK government for registration

	then EU for allocation. Action and money required -should cut out the middle man and go straight to EU to get changes accepted - Big issue to work on is greening/ EFA and getting NFM measures as an accepted land management type for this
2. Constraints of place & infrastructure	- A blueprint for coastal change - including NFM and landscape scale approach to firths - Understand NFM is a set of tools/approaches - How often do Local Authorities carry out subsoiling/aeration on their playing fields, open ground etc.? - Need to consider a cost/benefit appraisal for various project types with related benefits - Identify areas where large woody debris dams and riparian woodland will provide benefit and prioritise funding of modernising vulnerable bridges/culverts downstream to minimise any negative perceptions issues of large woody debris - Everywhere/one can contribute to the solution - More promotion of SuDS/urban water management as an effective form of NFM - Need to demonstrate large scale actions - If we accept that NFM is part of a systems approach then these 'constraints' are part of the existing systems so we should work with or adapt them - Promote principles of NFM through urban environment were costs and benefits etc. more likely to stack up - Infrastructure assets that form barriers to flood already could be enhanced using NFM measures - Deliver NFM in small urban catchments - lots of floodplain open space (parks, semi-natural habitat) which provides the physical space to deliver NFM e.g. addressing morphology pressures, floodplain woodland/ wetland etc. - Large scale needs long-term commitment - Promote GI [green infrastructure] as NFM in urban areas and build into surface water management plans - Use the Land Use Strategy
3. Gaps in evidence base	- Investment in pilot and experimental catchments but expensive so no point in inventing lots of new ones. Invest in existing where there is a baseline etc. - Catchment laboratories across the UK - Strategy for coherence to "jig-saw" funding across agencies/ government/ research councils to fund a small number of agreed long-term catchment studies and extend funding for existing well-founded studies. In designing catchment studies, challenge of "upscaling" a major focus to facilitate development of better models - Large scale demonstration 200 km^2 (gathering evidence) [Others added: Second this. Third this.] - Long term research on effectiveness [Another added: Yes] - Evidence base – Work together throughout UK to collate existing and implement necessary gap-filling studies. No Scottish study – needed? - Modelling of NFM at larger catchment scale i.e. >200 km^2 - Make funding available for monitoring – and guidance on how to monitor effectively - Full analysis of results of data and anecdotal info based on discussion. How have

	things been done and what is now not being done. • Collate evidence on small scale too! • Evidence solution: Compile and evaluate implemented solutions; Resilience to certain flood events should be defined in output of investigation • Action: Developing clear, focussed, researchable research questions – what are the key gaps in evidence? What research outputs will be of practical use to those delivering NFM? • Learn from our EU and international partners e.g. wetlands – Sweden, beavers – Belgium, wood placement – Slovakia • Show difference between knowing something works and knowing the £ value of it. Latter can hold back doing more!! • Just get stuff done if it: a) does not increase flood risk, and b) delivers some wider multiple benefits (WFD, access, landscape, biodiversity). FRM should be one benefit within a suite of multiple benefits • NFM opportunity mapping which identified flood risk benefits i.e. houses protected, infrastructure/farmland protected • Simpler, accessible to the layperson 'evidence' which is agreed to by most 'experts' • Raise awareness of NFM examples to help explain what it is and how it can contribute to managing flood risk. • Educate people on uncertainty. Hard engineering solutions do not stop flooding – they change the risk level. • Resource a small number of NFM demonstration sites with high quality interpretative materials 'in situ' / web-based/ option for guided tours with qualified staff • Develop one single NFM web portal which links evidence, tools, funds, policy/law, best practice etc. in one place • Modelling – which models to upscale?
4. Formal and informal expertise	• Develop training and tools to help people work across organisations or to facilitate connections between organisations (intermediaries) • Provide training • Use expertise - ensure budget to use multi-disciplinary team • Training and awareness with NFUS and Young Farmers. Courses of this type already exist and/or could be organised. [Added by another:] I agree • Event/workshop for LA engineers on incorporating NFM into flood schemes • Demonstration visits to see NFM • Provide evidence of solutions working and under which circumstances, to improve engineers certainty in application (when applying for funding) • NFM module on engineering institutions' CPD programmes • Through agriculture courses, diversify the course programme to include a holistic and integrated approach to land management • Better risk based methods • Rural colleges to teach multiple benefits to land management in all courses • A flood manager doesn't have to do everything - promote partnerships to bring different people/skills together • Get community involvement/ownership for implementing schemes e.g. include in tree planting, use for manual labour, education events.

	) An acceptance of uncertainty around these measures and a realisation that hard solutions are also uncertain
5. Discomfort with new approaches	) Persuading FRM colleagues to factor in upstream NFR measures as part of Flood Defence projects) NFM 'Water Schools') Compulsory training for Local Authorities in NFM) Begin with education within organisations (Local Authorities, government) before taking to stakeholders) Use innovative communication techniques) Demonstration sites on land owned/managed by innovator farmers) Establish demonstration sites covering a range of actions and site types) Use local examples to persuade people e.g. highlight urban green infrastructure not the 'far away' tree planting) Talk about NFM in terms of green infrastructure and engineering (where appropriate)) Information exchange/ engagement with landowners/ land managers) NFM needs to up its game! More engineering, more storage.) Agencies to develop a rapid response capacity within their 'comms' teams to scotch myths pedalled by media who simplify/overstate role of NFM) Do what the RRC [River Restoration Centre] did for river restoration. Take sceptics to demonstration sites and meet the locals.) Demonstration sites where landowners and others can see NFM in practice, hear others' experience, learn from their peer group.) Explain things better to public. When NFM is explained well public are often more supportive.) Delivery of access for maintenance effect privacy of properties) Identify how to overcome these problems (scenario- flow chart)) Remind people of the progress in the past that was uncomfortable i.e. Victorian engineering) Use Community Flood Resilience groups to raise awareness/ understanding of NFM within their communities. May need some training first!!) Not all measures have long time lags) Education, Education, Education and some training!) Field trips) Develop social media tools (like French video on NFM) to promote NFM to local communities) Coordinator role would assist with this through one-to-one discussions. Talk not written guidance.) Develop more 'trusted intermediaries' (cf. the Tweed Forum) based on existing River Trusts

6. Challenges of collaboration	) Encourage catchment management) Integration – join up catchment working! a) between policies (e.g. RBMP, FD) b) institutes c) stakeholders -> risk of duplication and not joined up! -> Need for intermediary to govern e.g. rivers/catchment council.) Enable co-creation / co-design) Resolve internal organisation issues and bring 'Integrated Land Management' up the agenda for all – Collaboration works well in the UK but needs the right people.) Regionalisation of Land Use Strategy to coordinate people & policies.) Set up catchment forums including Environment Organisations + Local Authorities + Other stakeholders for a holistic approach.) Independent, trusted neutral organisations or project officers to take forward catchment collaboration e.g. Tweed Forum and Sniffer/Adaptation Scotland [Added by others: I agree; I agree!].) Need for trusted intermediary and partnership body to lead, engage and deliver. Needs to be plugged into land management community.) Use existing platforms to work collaboratively e.g. local advisory groups, local plan districts.) New local fisheries management organised to have catchment management responsibilities – build on best practice from trusts [i.e. fisheries trusts, clarified in person by the person who wrote the note]) Collaboration Solution: Identify method of implementation / Process for local authorities/NGOs to implement solution.) Use organisations trusted by landowners/farmers to explain/advise on funding availability for implementation of NFRM measures e.g. Farmers' Unions; Rural Development Agencies.) Focus on persuading land managers – not incentivising or coercing <crossed out pound sign>) Longer timescales for ECAF) Funding / programmes to cover actions required at feasibility stage of NFM projects / ideas.) (More – ECAF already provides some) funding for bottom-up land manager engagement to build consensus on a desired integrated land use strategy including NFM (and all other ecosystem services / benefits). Make this the norm. – Regional LUS [Land Use Strategy] pilots – WEAG sub-region pilots.) Clear governance is needed - Clear leader for project and understanding of rules and responsibilities of stakeholders.) Education: in schools as well as through other media to bust myths about dredging et al.) Consider a wider range of drivers – rebadge or promote in a more holistic way – WFD, biodiversity, sediment management, tourism, erosion control etc.
7. Statutory processes, planning and appraisal systems	) We need to bridge the gap between NFM and FRM.) Move to a catchment restoration multi benefits model.) Set up a collaborative approach to address Government/at all management levels/ to accept change is required.) Highlight to Local Authorities that NFM can and should be included within Flood

	Protection Schemes. - Very early engagement with regulators/planning is needed, as soon as NFM opportunities are identified, where consents and approvals will be needed (incl. under Reservoirs Act). - Include NFRM in capital work project assessment as part of a bid for funding (as NRW). Make it a binding duty. - Local catchment managers who know the community can make integrated decisions. - Use the Land Use Strategy to guide planning and land use planning policies. - Streamline regulation; make NFM a 'permitted development' under planning law. - Identify key NFM studies to support so that we maximise opportunities to implement NFM and integrate with other catchment issues. - Link to efforts to improve collaboration. Use project officers or independent organisations to take forward collaboration can also work through processes and planning, etc. - An appraisal process not just focused on cost benefit analysis so we are able to justify less tangible WWNP measures. [one person added - I agree!] - We should provide regulatory and funding mechanisms which allow or promote connection between rural and urban areas with respect to cost and benefit (e.g. town planners currently have little remit in agricultural NFM schemes). - The planning system has limited control over rural land uses which do not constitute "development" such as NFM measures. We need to align Local Development Plans and Local Flood Management Plans. - Can we have a House of Commons select committee enquiry into NFM? - We need more awareness-raising and communication with SG policy leads, out with flooding, to improve coordination of policy and avoid conflicting policy messages. [Note from authors of this report: contacts in other policy areas such as Land Use Strategy and Biodiversity were invited to this meeting. SNH were represented at this meeting]. - Need to look at lots of ways to get the message out about why we don't want dredging – not only when 'on the defensive' after flooding events. - We need a review of legal and policy framework for integration of NFM into FCRM - Think of it all as SFM [Sustainable Flood Management]. NFM is not an easier option. - Communicate. We require land holders/farmers to engage /facilitate NFM as part of cross-compliance under Good Environmental Agricultural Condition (GAECs). - We need to work on coordinating catchment work on NFM, diffuse pollution, biodiversity, morphology. - We need to actually use the Land Use Strategy.

8. Other Actions	*Need to explicitly discuss liability and responsibilities* • Liability can be dealt with through contracts tied to funding • Need to not worry about some issues: Land-managers cannot 'undo' actions previously installed by L.Auth e.g. re-meanders, and any measure installed by L.Authority can be maintained by that Local Authority. We already have precedent for maintaining infrastructure despite uncertain budgets e.g. road maintenance. *We need to create new/better ways to incentivise NFM* • Need to identify new sources of funding e.g. as per the peatland code • Payments for maintenance are needed, not just payments to install new measures. However, this does not apply if Local Authorities originally installed the measure, in which case the Local Authority will do the maintenance. • Need long-term compensation/ payment mechanisms for maintenance, although probably we will struggle with their adoption for maintenance, as has been seen with SuDS. *Need to work upstream* • 'Source' measures are less risky to carry out (less risk of unintended consequences), are less expensive, and less bureaucratic than FRM measures carried out further down the watercourse… we should therefore target encouraging these? *Need to work with communities and land-managers* • Need multi-stakeholder 'ownership' of NFM that includes communities • Where NFM is an option and specific examples have been suggested, start conversations with land-managers to determine what they think their role would be. We need actual examples. *Need to learn from professional networks and other experiences* • WWNP/NFM is very much like SuDS. Can we draw on Ciria's work on SuDS and apply this to NFM? [http://www.susdrain.org/resources/ciria-guidance.html] • Government to engage with insurance industry on long-term issues which promote adaptive solutions & thinking. *Other points* • FM and DFM [?]. SG is supportive of NFM as part of total SFM approach. • We need to reduce NFM fundamentalism – it is not the only relevant approach to flood risk management. • Need to do NFM together with other measures such as PLP (property level protection), i.e. by working with insurance industry.

Annex 6: Action Planning

In the afternoon, four separate groups discussed how to tackle the four challenges identified earlier in the day as being priorities. These groups' discussions were informed by the post-its of brainstorming session to which everyone contributed: each group was tasked to synthesise and refine these in order to produce an action plan detailed what needed to be done, how, by whom and when. The four subheadings below list the results of each group's discussion. It is important to note that these are not fully-developed action-plans: sometimes some actions or issues require more discussion.

1. **Improving funding and resources available to support NFM**.

What	How	Who	When
1. Pay farmers/land managers for storing water on their land/NFM (either a PES scheme or a flood risk management scheme integrated though current farm payments.)	⁾ Could focus first on highly vulnerable zones – these would be the priority areas ⁾ Would involve an area based assessment. Land type and capacity for storing water would be assessed, and payments would be made accordingly. ⁾ When the piece of land was dry it could be grazed. When water is stored on it, and compensation would be paid. ⁾ Should be taking place at the catchment level ⁾ How would we know if they are making it worse downstream?	⁾ But what do farmers want? How do they want to be paid and in which circumstances? More work required to answer these questions. ⁾ Some farmers do not want to be paid to store water. They want to farm. ⁾ Farmers have traditions, and storing water on their land can go against these traditions, other farmers may be happy to take any available payments.	⁾ As soon as possible. Without the payments, farmers can't afford to store water on their land. ⁾ Must be a long term payment as could be an irreversible land use change.
2. How to pay farmers to store water on their land – integrated land management plans or 'mini land use strategies' at the farm level	⁾ They would be integrated land management plans. The ECAF would sit above it to deliver wider catchment/landscape scale benefits ⁾ Bottom up farm scale planning	⁾ Not many people applying for ECAF ⁾ It is not just about throwing money at farmers, it is about what we are asking them to do. Benefits have to be tangible, visual and measurable so they can see them and so can the public. We all need to see	⁾ We are a long way from this happening at a national scale. ⁾ There needs to be some proof of concept first, some examples that farmers can see working. ⁾ There are some

	• This was going to be the model for the SRDP • Farm scale mapping – look at the types of benefits that land could provide • The plan recognises the services that the land can provide • Align these services with existing funding mechanisms.	the point of what we are doing.	examples of this happening already in the Cairngorms National Park in Scotland.
3. Paying farmers for NFM – thinking of a new CAP arrangement	• Remove barriers to use of private funding for example new GI fund[7] requires match funding of 60% but cannot be private funding • Benefits must be quantifiable and measureable. • Maybe a different idea would be to pay farmers depending on what type of land they have. Low grade land gets high farm payments, high grades get less payments.	• But if benefits were to be quantifiable and measured, whose responsibility is it to do that? Who should measure impacts? More emphasis would need to be on checking delivery of actions.	

[7] http://www.centralscotlandgreennetwork.org/news-and-events/news/724-snh-funding-for-green-infrastructure-development

2. **Tackling the challenges of collaboration**.

What	How	Who	When
Establish trusted, independent intermediary bodies. These would keep track of different projects within a catchment and increase communication and integration between projects. Good models of catchment partnerships already exist for the Tweed, South Esk, Dee and Spey. Intermediary bodies should also be involved in linking NFM to other concerns: pollution, biodiversity, etc.	• Fund staff costs through partner organisations • Appoint a charismatic key individual with good stakeholder engagement skills to co-ordinate/ act as catchment manager.	• A mix of partners needed (e.g. in Scotland need SEPA, Local Authorities, Forestry Commission Scotland and Scottish Water). • District Fishery Boards are well-established bodies already working on a catchment scale but it is unclear whether these would be useful to collaborate on NFM or how catchment management, NFM and FRM relate to existing statutory responsibilities around fishing – need for a new independent body. • Questions remain around how communities can be involved in the collaboration process	• Setting up intermediary bodies will take a long time – relationships take time to build. • Various groups are thinking of setting up catchment partnerships at the moment

3. **Tackling gaps and uncertainties in the evidence base**.

What	How	Who	When
1. Monitored demonstration sites are required, which: a) Extend the life of existing monitored catchments (longer datasets) b) Develop 'new' monitored catchments around the gaps in knowledge found from point a)	⁃ Funding is needed This could come from: o Research councils o EA/ SEPA/ NRW/ DARDNI collaboration o H2020 o Heritage Lottery Fund (HLF) funding → partnership funding ⁃ Key point - lots of activity already started to kick start this action which is very promising but how do we bring this fragmented research together?	⁃ EA 'Working with natural processes catchment laboratories project' will help to address this. Just kicked off. ⁃ Green Infrastructure project research e.g. info for case studies, how soft compares to hard engineering (small pots of money) ⁃ Scottish Government are part of Interreg funded project 'Building with Nature' ⁃ 10,000 raingardens project.	⁃ Yesterday! – important to have baseline datasets before interventions are installed in catchments. ⁃ Until… well that depends on the measure and catchment. Funding could run for decades.
2. Synthesis and analysis of existing data (could help to answer the question of how much monitoring we need).	⁃ Interlinked with above action as it needs funding from the same sources.	⁃ Needs statistical tools and models – maybe some new tools (see action 3 below) ⁃ Need to gather the information somewhere – e.g. a web based resource – a cloud tool	⁃ Now
3. Modelling tools are needed to upscale – need some bespoke or new tools to address these challenges e.g. which models and how do you integrate knowledge from action 1)	⁃ Same points as above	⁃ Similar points to above ⁃ EA have just completed a modelling framework that will help	⁃ Linked to above action
4. We need new communication tools, could be: a) Virtual catchments b) Web based resources	⁃ Requires the computer science community	⁃ Would require a big leap forward in detailed visualisation modelling but would offer holistic/multiple benefit approach	⁃ Soon

c) Data/modelling syntheses d) Communication of uncertainty e) Mapping the impact of NFM f) Mobile phone apps to visualise flooding			

4. **Working long term and assigning liability**.

What	How	Who	When
Provide Long-term funding for maintenance of land for FRM and to provide other benefits. Also need funding to recognise and protect provision of water attenuation service (even where no maintenance needed).	) CAP reform to incentivise land-management so as to maintain ecosystem services incl. FRM.) Allow CAP subsidies to be allocated on the basis of regional Land Use planning (see below).	) UK or country (e.g. Scotland) work with other stakeholders to lobby EU commission.) UK or country to adjust payment rates within current scheme rules	) ASAP!
Re-democraticise land-use planning. Regional land-use plans may offer a way to do this.	) The two Regional Land Use pilots carried out under the LUS should be carried out more widely.) The LUS Action Plan should be comprehensive and implemented.	) Local Authorities or regional land administrations	) Consider how to strengthen LUS, ASAP!
Long-term monitoring of flood measures in terms of effects on flows but also in terms of other effects e.g. on biodiversity	) Knowledge collection and sharing between all knowledge holders and scientists	) Academic organisations, MSc and PhD projects – low cost knowledge collection and sharing	) Need to discuss prior to project start for best /most productive outcomes.
Need a long-term plan for adapting the coast, which includes NFM	) Need to understand coastal change) Use this information to develop a plan and prioritise actions	) Government should lead on this	) Need information collection before a plan can be made

Annex 7: Resources

Below is a selection of publications from the last 5 years that are relevant to understanding and tackling barriers to NFM. We focus on publically-available reports, rather than academic papers. This selection is biased to Scotland, more recent work, and to work focused on understanding or tackling barriers. It is therefore in no way exhaustive!

To keep up-to-date with new reports and progress on this subject, we suggest readers regularly visit sites such as http://evidence.environment-agency.gov.uk/FCERM/en/Default/FCRM.aspx or http://www.gov.scot/Topics/Environment/Water/Flooding/FRMAct/saif/NFMG.

2016

Natural Flood Management Handbook. *SEPA (Scottish Environment Protection Agency). ISBN: 978-0-8575. Available at: http://www.sepa.org.uk/media/163541/sepa-natural-flood-management-handbook.pdf*
This handbook explains how NFM can contribute - as part of a suite of measures – towards reducing the impact of frequent flooding, especially smaller scale flood events. In addition to information on how to select and design NFM features, it includes advice on funding, implementing and managing NFM projects.

Holding Water: Working with Nature to Ease Floods and Droughts. *Quinn, P. Water Note Note 2. Available at:* 34T*http://www.ncl.ac.uk/sustainability/news/item/policynoteworkingwithnaturetoeasefloodsanddroughts.html*
This policy note draws on a workshop on nature-based solutions for floods and drought held at Newcastle University in August 2015. It gives an overview of the aims of NFM, principles for delivery, and examples of NFM measures.

2015

Learning from community led flood risk management. *McLean, L., Beevers, L., Waylen, K., Wright, G., Wilkinson, M. CREW report CD2014-12. Available at: http://www.crew.ac.uk/publications/learning-community-led-flood-risk-managment*
This project explored what can be learnt from working with a community to identify what flood risk management measures are needed, acceptable and may deliver multiple benefits. The project makes a number of key recommendations and suggestions for facilitating NFM in future, including alterations to farming subsidies, but also more work to engage with the diversity of opinions and attitudes currently to be found within rural communities. Several of these recommendations e.g. to explore the role of trusted intermediaries, echo those from earlier reports.

Assessing the mechanisms for Compensating Land Manager. *RPA, RHDHV and Allathan Associates. Project RPA/001/14, report for the Scottish Government. Available at http://rpaltd.co.uk/uploads/report_files/technical-report.pdf*
This report is based on a study to identify and assess 'mechanisms' for compensating land managers in Scotland. A 'mechanism' was defined as an agreement or arrangement (between the public body and the land manager, or the public body, land manager and a broker) which enables the implementation of an NFM measure. Whilst the mechanism may involve a monetary payment, it could alternatively be advice, or payment in-kind e.g. replacement feed for a destroyed batch.

Woodland and Natural Flood Management-Lessons Learned. *JBA Consulting. Final Report for the Forestry Commission. Available at: http://www.forestry.gov.uk/fr/beeh-9xaemq*
This report identified research, demonstration and monitoring projects undertaken in the United Kingdom involving the implementation of woodland NFM. One of the main outputs of this review was database of projects identified, an excellent source of examples of UK NFM projects that have involved woodlands. CREW also provides an excellent database of NFM cases at http://www.crew.ac.uk/NFMcasestudies

2014

Natural flood management from the farmer's perspective: criteria that affect uptake. *Holstead, K; Kenyon, W; Rouillard, J; Hopkins, J. and Galan-Diaz, C. Journal of Flood Risk Management. Available at http://onlinelibrary.wiley.com/doi/10.1111/jfr3.12129/abstract*
This research explored farmers' perceptions of NFM and the criteria influencing decisions to implement NFM. Building on a mixture of data collected across Scotland, the paper identifies six key criteria that farmers consider when implementing NFM: economics, availability of advice and support, public perception, joined-up policy, catchment planning and traditions.

Working with natural processes to reduce flood risk: a research and development framework. *Barlow, J., Moore, F. & Burgess-Gamble, L. Report for the Environment Agency. Available at https://www.gov.uk/government/publications/working-with-natural-processes-to-reduce-flood-risk-a-research-and-development-framework*
This project identified evidence gaps and future research needs relating to working with natural processes (aka NFM), to develop a framework for a prioritised programme of research in this area. Research priorities identified included mapping of priority catchments, modelling impacts to flood risk, developing technical guidance, examining cultural barriers, and joining-up delivery of the Floods and Water Framework Directives.

2013

UK and Ireland natural flood management practitioner workshop. *Holstead, K and Wilkinson, M. CREW CD2012/23. Available at http://www.crew.ac.uk/publications/uk-and-ireland-natural-flood-management-practitioner-workshop*
This report arises from a UK and Ireland practitioners workshop held in February 2013. The aim was to share information between NFM projects and to understand whether there are lessons that can be learnt, particularly in practical implementation, from those with extensive experience in the field. Many of the questions raised by this meeting highlighted the need for further evidence about NFM, to understand or demonstrate the effectiveness of measures. It was also thought that implementation would be encouraged if regulatory consent could be granted for packages of measures, rather than individual measures, and some flexibility in implementation was allowed. The need for good communication, trusted intermediaries and demonstration projects was emphasised, echoing other discussions.

Natural Flood Management in the context of UK reservoir legislation. *Wilkinson, M; Holstead, K and Hastings, E. Report for CREW. Available at http://www.crew.ac.uk/publications/natural-flood-management-context-uk-reservoir-legislation*
This briefing is informed by a literature review and consultation with practitioners from the "Slowing the Flow at Pickering" NFM project (http://forestry.gov.uk/fr/slowingtheflow) regarding their experience of UK reservoir legislation and its impact upon NFM implementation. It provides

information about the situation in Pickering and highlight barriers to the implementation of NFM in Scotland, in light of the Reservoir (Scotland) Act 2011.

Identifying Opportunities for Natural Flood Management. *SEPA, Scottish Environment Protection Agency. Available at* *https://www.sepa.org.uk/media/33480/natural_flood_management_2013.pdf*
Opportunities for NFM were identified by SEPA in "natural flood management maps". This report explains how those areas were identified and how to interpret and use the information in the maps.

2012

Factors that affect uptake of natural flood management features by farmers in Scotland: A review. *Holstead, K; Kenyon, W and Rouillard, J. Report for CREW. Available at* *http://www.crew.ac.uk/publications/factors-affect-uptake-natural-flood-management-features-farmers-scotland-review*
This report reviews recent research and literature to determine those factors which are likely to influence farmers' implementation of natural flood management features on their land. A number of factors are important for farmers in decisions about whether they should implement NFM measures on their land such as economic factors, farm characteristics and pests and parasites such as fluke.

Natural flood management (NFM) knowledge system: The effect of NFM features on the desynchronising of flood peaks at a catchment scale. *Blanc, J; Wright, G and Arthur, Scott. Report for CREW. Available at* *http://www.crew.ac.uk/publications/natural-flood-management-nfm-knowledge-system-effect-nfm-features-desynchronising-flood*
This report aimed to verify the current state of knowledge on NFM. It explored the effectiveness of NFM features at a catchment scale, particularly in relation to how they may be used to desynchronise flood peaks and therefore reduce downstream flood risk.

Natural flood management (NFM) knowledge system: The effect of land drainage on flood risk and farming practice. *Blanc, J; Arthur, S; Wright G and Beevers, L. Report for CREW. Available at* *http://www.crew.ac.uk/publications/natural-flood-management-nfm-knowledge-system-effect-land-drainage-flood-risk-and-farmi*
This report also aimed to verify the current state of knowledge on NFM. It briefly reviewed the historical development of land drainage and looked at the impacts on flood risk from land drains and the recent move towards drain-blocking.

2011

Natural Flood Management Implementation – Learning from Practice Workshop. *SNIFFER (Scotland & Northern Ireland Forum for Environmental Research) Final report, Project FRM26. Available at:* *http://www.sniffer.org.uk/files/1913/4183/7992/NFM_Workshop_Report_Final.pdf*
This report is the result of a workshop to identify actions required to implement NFM on-the-ground over the next 5-10 years. These actions included the development of an NFM handbook (now published in Jan 2016); providing a methodology for assessing contributions to flood risk reduction from NFM; delivering demonstration projects 'on the ground'; and improving communications to change attitudes to NFM.

Understanding the opportunities and constraints for implementation of natural flood management features by farmer. *SNIFFER (Scotland & Northern Ireland Forum for Environmental*

Research) Final report, Project FRM21. Available at:
http://www.sniffer.org.uk/files/9513/4183/7995/nfm_workshop_report_final.pdf
This report, the result of two workshops with the flood policy community and land-managers, explores how existing processes and incentives affect how the farming landscape is used to reduce flood risk. It identified specific recommendations for targeting land-managers with specific information about NFM and its eligibility with farming subsidy schemes, the wider context of FRM, and the need for trusted intermediaries to act as facilitators.

Mobilising the contribution of rural land management to flood risk management in Scotland. *Beedell, J, Morris, J. and Hess, T.M. CR/2010/14. Report to Scottish Government. Available at www.gov.scot/resource/0039/00393714.pdf*
This study explored in the potential contribution of rural land management to flood risk management and the range of policy instruments that might be used to encourage land managers to provide FRM services in Scotland. These include economic mechanisms to compensate and reward land managers for changes in land use and practices that help to alleviate flooding problems.

Farmers assist in flood management. *Aquarius Project. Main findings from Aquarius, Farmers as Water Managers in the North Sea Region: Aquarius End Conference Magazine, October 2011. Available at http://www.aquarius-nsr.eu/Aquarius.htm*
This reports the findings of 'Aquarius', an international project aiming to find and implement sustainable, integrated land-water management activities with land managers. The project focused on seven national pilot projects in the North Sea region including Tarland, Aberdeenshire.

Natural Flood Management. *Wentworth, J. POSTNOTE no. 369, 5 Dec 2011. Available at http://researchbriefings.parliament.uk/ResearchBriefing/Summary/POST-PN-396*
This research briefing provides a good general overview of the policy drivers, scientific basis and implementation of NFM in the UK in 2011.

2010

Land manager contributions to protecting the Dee Water Environment. *Waylen, K; Blackstock, K and Cooksley, S. Deliverable 1.14 for REFRESH. Available at http://www.refresh.ucl.ac.uk/barriers_to_action*
This reports the findings of a focus group in Aberdeenshire, Scotland and compared to a similar workshop held in Greece which both aimed to understand barriers for farmers and land managers to implementing actions to protect the water environment. It was focused on meeting the requirements of the WFD, but many similar barriers were considered. A variety of overlapping economic, personal and social and institutional barriers were identified, with some similarities to those now facing NFM.