

Report No: 002
Water Metrics and Standards
Review of current approaches,
challenges and issues

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Section 1 INTRODUCTION

1.1 Purpose of the Study

This study was initiated by a working group made up of SEPA, NatureScot, Forest Research, IUCN UK Peatland Programme, UK Centre for Ecology and Hydrology and University of Stirling following wider water and environmental sector consultation. The purpose of the study is to identify and (if necessary) develop a common approach to measuring and valuing water related ecosystem services with a view to using these metrics and standards to attract private finance and investment to support nature-based solutions, rewilding and other regenerative land uses. These should be aligned with the metrics used by public agencies, to facilitate the effective blending of public and private finance by allowing transparent assessment of who is paying for what.

The aim, therefore, is to identify or develop metrics and standards which:

Recognise and value multifunctional benefits of nature-based and land management solutions

Encourage and support private 'green finance' investment (including as part of hybrid finance approaches)

Allow public finance to be more effectively and efficiently targeted (including as part of hybrid finance approaches)

This report covers Phase 1 of the study and is focused on scoping out the current stage of development of water standards, metrics and markets – with particular reference to:

1. potential applicability in Scotland
2. any standards and metrics which are sufficiently established to recommend to potential green investors.

Note on usable metrics and standards

To be of value, metrics and standards must be:

- measurable, scientifically robust and credible
- usable in a range of real world, field settings, across different sectors
- replicable and scalable
- meaningful to all key stakeholders – giving confidence in their use and application.

(these criteria were agreed by the working group members¹)

¹ See Appendix 1 for details of the working group membership

This work sits alongside ongoing work on biodiversity metrics and nature standards and the ongoing review and evolution of the Woodland Carbon Code and Peatland Code. Work is also underway to develop a Woodland Water Code (led by Forest Research). This code will initially focus on water quality benefits from reduced pollutant and sediment loads. The inclusion of flood alleviation and water cooling will also be considered.

1.2 Phase 1 methodology

Between August and December 2022, following desk research into the current projects and programmes which are targeting water related benefits from nature-based solutions, a series of remote, informal consultation interviews were carried out by Deryck Irving from the Hydro Nation Chair Research and Innovation Programme, based at Stirling University.

These interviews focused on key water sector players in Scotland and on organisations from across the UK which are involved in projects and initiatives which aim to leverage funding into the delivery of nature-based solutions for water. A list of consultees is included in this report as Appendix 1.

The questions which form the basis for the interviews are included in this report as Appendix 2. Please note that interviewees received the questions as part of the invitation to contribute and that the interviews were free form and generally addressed the questions as part of wider discussion.

Two workshops with SEPA staff (looking primarily at data, modelling and mapping) were also held.

Feedback from interviews was presented at regular intervals to the working group who were able to add detail and perspective to shape this report and its recommendations.

The observations and recommendations contained within this report are also informed by insights gained from a range of meetings relating to natural capital, nature-based solutions and green investment which took place across the study period and in the first two months of 2023.

1.3 Nature-based Solutions under consideration

At the onset of the project, the working group agreed, to ensure that the study was manageable and to give clarity to interviewees, that the scope of the study would be restricted. The following nature-based solutions were considered as ‘in scope’ for this study²:

<p>Woodland creation and enhancement – including riparian woodland and woodland within wider catchments</p>
<p>Peatland restoration and management – both upland and lowland peat</p>
<p>Wetland creation and management - including online and offline wetlands (including ponds), leaky barriers etc.</p>
<p>River naturalisation and realignment</p>
<p>Water protection and buffering functions – using natural habitats to protect water sources and buffer pollutant inputs to rivers and water supplies from adjacent land</p>

1.4 Water related ecosystem services considered in this study

<p>Water quantity and flow – flood risk management and drought mitigation; reducing the scale of peaks and troughs in water quantity and flow rates</p>
<p>Water quality – reducing sediment load, nutrient load, pollution levels, reducing water temperature</p>

Other social, environmental and economic benefits accrue from NbS interventions. The project group anticipates that these will be picked up by other work on metrics and approaches (for example, the Carbon Codes and emerging biodiversity metrics). Water metrics and standards must, however, be compatible with and operate alongside these ‘other’ metrics and standards with due consideration to the challenges of demonstrating additionality and accommodating trade-offs.

² This selection was to provide a starting place rather than excluding other measures that provide water benefits such as in coastal or urban settings.

1.5 Who might want to pay for NbS?
(- the key components of a hybrid funding system)

Several interviewees stressed the importance of understanding the roles and drivers for the different players within a hybrid funding/investment system³. This understanding is crucial if we are to develop projects, programmes and portfolios based on NbS.

FUNDERS (philanthropic, public etc.)	INVESTORS	BUYERS	BENEFICIARIES
Fund initial research, mapping and business case development	Provide upfront resource to develop products	Buy products and, therefore, pay return for investors.	Beneficiary (direct and secondary) interests will influence and may even determine funder and buyer priorities
<p><i>UK and Scottish Government 'investment readiness' funding is a prime example</i></p> <p><i>Philanthropic funders also play a role in this area</i></p>	<p><i>Impact investors may look for specific outcomes</i></p> <p><i>Philanthropic investors may look for 0% returns</i></p>	<p><i>Buyers will be most interested in the detail of what you are selling</i></p>	<p><i>Influence may be through policy and legislation or through organisation strategy priorities</i></p>

The point of greatest need for detailed metrics and standards within this this system was summed up by Krista Patrick from the Greater Manchester Authority who stated that:

'Experience shows that buyers care about the detail of what you are selling; investors (even impact investors) much less so.'

And by Jack Spees from the Ribble Rivers Trust whose experience was that:

'Funders are interested in whether buyers are happy (not the detail of modelling and calculations). Buyers are interested in whether the regulators are happy (with the rigour of models, validity of proxies and so on).'

³ Current hybrid schemes operate a debt-based model with funding and investment upfront and repayments made from services sold to buyers – it is difficult to see any workable alternatives to this model at present.

Note on ‘investors’:

Anecdotally, many of the largest investment funds and companies are interested in including natural capital and NbS within their investment portfolios as a means of enhancing the Environmental component of their, and their clients, ESG frameworks - this positions them in a ‘Buyer’ role. Current indications are that most of these companies are seeking to deliver ‘additional’ NbS as part of their carbon offsetting by targeting ‘Charismatic Carbon’ offers.

Recent discussions relating to private sector attitudes to the use (and funding) of Blue-Green Infrastructure have indicated that asset managers are unlikely to be able to access funding for non-mandatory ESG initiatives. This suggests that there may need to be policy which prioritises water outcomes (alongside, for example, biodiversity) before ESG driven investment is a consistent part of the picture.

Section 2 METRICS AND STANDARDS IN USE ACROSS THE UK

2.1 What is routinely measured by Scottish Water and SEPA?

There is a logic to linking metrics to the aspects of water quantity, flow rates and quality used by regulators and water companies.

Scottish Water

Scottish Water routinely measures the following quality parameters at treatment plants and, increasingly, in catchments:

- Colour
- Turbidity
- Total Organic Carbon (TOC)
- Dissolved Organic Carbon (DOC)
- Coliforms
- Iron and Manganese

In addition, Scottish Water monitor volumes and flow rates of water in urban combined sewers systems – including the development of smart monitoring networks.

SEPA

SEPA is the lead agency for River Basin Management Planning and lead authority for Flood Risk Management Planning in Scotland. It is responsible for monitoring the water environment by assessing water quality and quantity. It is also responsible for monitoring Scotland’s bathing waters. SEPA undertakes targeted and routine monitoring to deliver its public services to protect, manage and improve Scotland’s Water Environment.

All information for river basin planning can be found via the Water Environment Hub [RBMP3 \(sepa.org.uk\)](https://www.sepa.org.uk). It provides information on each water body, pressures, measures and the

objectives that have been set. The latest classification information can be found at the [Water Classification Hub \(sepa.org.uk\)](https://www.sepa.org.uk). Flood maps which indicate which areas are likely to flood are also available [Flood maps | Scottish Environment Protection Agency \(SEPA\)](https://www.sepa.org.uk). More specific local information on managing flood risk are available via the flood risk management plans [Flood Risk Management Plans | SEPA](https://www.sepa.org.uk). Sampling results and water quality classifications for bathing waters are also available [Bathing Waters : Summary of last season \(sepa.org.uk\)](https://www.sepa.org.uk). Scotland's Environment Web ([Home | Scotland's environment web](https://www.sepa.org.uk)) also provides a way to view a range of data from different organisations via interactive maps.

SEPA is reviewing how to make its information and data more easily available to inform decisions about targeting land management actions to address water quality and quantity issues. It has reviewed the types of information that could inform targeting, quantifying and measuring water benefits from land management. This review found a range of existing information that could be presented in easier formats for targeting action for example to address diffuse pollution and targeting action to restore riparian vegetation and help rivers restore their physical condition. There is also new information planned over the next few years, for example in relation drought resilience planning, natural flood management and targeting coarse sediment. However, its current monitoring regimes are for specific purposes such as flood warning or meeting the requirements of River Basin Management Planning reporting. Its monitoring is not at appropriate spatial scales to measure the impact of specific land management measures from a single land holding or across multiple land holdings in a specific catchment. However, it could be used to help with monitoring wider water body changes and ground truthing new monitoring. SEPA has a role in providing validity to nature-based solutions providing water quality and quantity benefits, and this could be provided through guidance to agencies responsible for verification.

Other monitoring

It is important to note that, while this section focuses on measurement and monitoring carried out by SEPA and Scottish Water – as these variables potentially offer the greatest chance of developing recognised and accepted metrics. There is also a role for research organisations such as Forest Research, NERC, CEH, James Hutton Institute and University of Stirling (Forth ERA) to address gaps in understanding and develop new approaches to monitoring and verification via existing research programmes. There are also in allied areas such as transport infrastructure. A review of what work is already proposed would enable understanding of how gaps in understanding how to measure water benefits from nature-based solutions. There is also work at a UK level for example via the RCUK floods and droughts research that could inform this work. It is important that new approaches are explored and reviewed as part of the way forward on water metrics and standards.

The Cairngorms National Park Authority includes freshwater habitats in the Cairngorms Nature Index with an aim that 70% of watercourses meet ‘good ecological condition’ criteria. To plan and assess this, the authority started out with WFD but realised that something more was needed to fully capture and address functionality. To do this, they have begun to adapt (and adopt) the Norway Nature Index and the ecological function indicators it uses. This will include ecosystem indicators using species and habitat data alongside key processes – such as flooding frequency.

<https://storymaps.arcgis.com/stories/fdbca8769683464c91b1dc23818aa239>

2.2 Which markets, systems and approaches are most developed?

The most developed NbS work areas relating to water (looking at the UK) are:

Water quality – nutrient trading

Most schemes and programmes in this area are looking at reducing phosphorus and/or nitrogen in water. EnTrade are active in several of the pilot projects in this field – including the Solent Nutrient Market pilot and the Somerset Catchment Market. The former looks at both nitrogen and phosphorus; the latter is focused on phosphate mitigation. Phosphorus is also the element being targeted in the work of the Ribble Rivers Trust.

These programmes are all underpinned by the Farmscoper decision support tool produced by ADAS. This is designed to assess agricultural pollutant loads and to quantify the impact of mitigation methods. The tool can be customised for different management and environmental conditions which are representative of agricultural areas across England and Wales. <https://adas.co.uk/services/farmscoper/>

It is important to note that this tool has not been used in Scotland – nor in the mix of conditions likely to be encountered in Scottish catchments. It needs, therefore, to be reviewed in Scotland before committing to its use to underpin nutrient trading. Other tools such as the Landuser Informer model developed in Germany for planning farm level actions to address pesticide pollution may also provide potential simple targeting tools linked to water quality improvements. This should also be reviewed for its value in Scotland.

It is worth noting that the Wyre NFM scheme is using Replenish as the tool to assess nutrient reduction (see section on Water Stewardship).

The markets for nutrient trading are driven by local and national policy commitments to:

1. Reduce nutrient inflow into catchments and systems which are under pressure due to high nutrient levels
2. Make developments ‘nutrient neutral’ – this has created the opportunity for nutrient offsetting and the trading of nutrient credits

Natural England Framework for Wetland Mitigation Proposals

This framework relates specifically to constructed wetlands designed to capture nitrogen and/or phosphorus (it explicitly excludes more natural wetlands) and is linked to the creation of nutrient credits for areas with Nutrient Neutrality requirements]. The framework includes design and monitoring guidance

<https://storymaps.arcgis.com/collections/6543a2f8de0348f683187ff268a79687?item=4>

It is important to note that the only part of Scotland where there are nutrient neutrality requirements in place is parts of the River Leven catchment around Loch Leven in Fife – these requirements relate primarily to septic tanks in existing and new developments rather than to wider land management.

Water Quality – Colour/Organic Carbon

A range of peatland projects have (or are currently) targeted reductions in TOC/DOC and improvements in colour alongside flood management and carbon outcomes. The Sustainable Catchment Programme (ScaMP) and the Upstream Thinking (UST) project in SW England are well documented examples of work in this area. In both cases, the driver is coming from prevention-led approaches to water quality being used by the water companies (United Utilities for ScaMP and South West Water for UST).

For more information on ScaMP and UST, see the CREW report *‘Reviewing best practice in the delivery of good drinking water quality using a prevention-led approach’*.

<https://www.crew.ac.uk/publication/prevention-led-approach>. Scottish Water has included this prevention-led thinking in its support of peatland restoration.

For these interventions, colour and OC in the catchment and at treatment plants are the key metrics. Evidence of effectiveness is still in relatively short supply and longer term and wider research is needed.

Natural Flood Management (NFM)

Natural Flood Management focuses on the use of NbS – including peatland restoration, wetland creation, riparian woodland, leaky dams and river naturalisation – to reduce flood risk within catchments. The key metrics, to date, for NFM relate to hydrological lag time, flood peak reduction, volume and duration of flood runoff. The Eddleston Water Project in the Scottish Borders has identified the first two of these measures as being most important and usable in their context. <https://tweedforum.org/eddeleston-project-database/>.

A potential additional metric relates to volume of storage (m³ of water per km² of catchment) – work may be needed to develop and agree such a metric.

In Scotland, NFM schemes and programmes have been predominantly publicly funded (with some grant input from philanthropic funders). Elsewhere, the Wyre Natural Flood

Management Project and various Landscape Enterprise Networks (LENS) programmes have brought private funding into NFM.

The Wyre Catchment Natural Flood Management Project

Multi-partner NFM project Wyre Rivers Trust, The Rivers Trust and Triodos Bank UK with partners including Wyre Council, United Utilities, Flood Re, Co-op Insurance and the Northwest Regional Flood and Coastal committee.

The primary outcome being sought is reduced flood risk (but benefits will also include carbon sequestration, increased biodiversity and improved water quality).

Key performance metrics for the interventions fall into two broad categories:

1. The practical function of the interventions as described (for example storing water during smaller flooding events).
2. The perceived reduction or delay in peak water flow delivering flood risk reduction during major flood events

[Note: Performance data is measured post-weather events by the Wyre Rivers Trust which informs annual reporting]

From <https://www.greenfinanceinstitute.co.uk/gfihive/case-studies/the-wyre-river-natural-flood-management-project/>

Note:

For both the LENS work on the River Eden in Cumbria and the Wyre NFM project, United Utilities (the water company) calculated their funding input on the basis of modelled flood risk management impacts and the likely financial savings in comparison to hard engineered solutions for their key infrastructure in the catchment. For the Wyre, United Utilities pay an annualised payment schedule that captures the value of the natural flood management benefit over a 120-year period.

James Airton from United Utilities pointed out that, for the Wyre, payments for the natural flood management benefits alone would not have been enough to make the project viable. Payments for the other ecosystem services, such as carbon sequestration, were necessary to reach a viable solution.

Water Stewardship (water supply continuity)

This relates to the retention of water within catchments to ensure that supplies are not adversely affected during times of low rainfall and drought. This has obvious applicability in areas at risk of water shortage – including large areas of Eastern Scotland.

The most established approach to water stewardship is Volumetric Water Benefit Accounting (VWBA). VWBA provides a *'comprehensive standardised and science-based*

methodology to calculate and value the benefits of water stewardship'. It is recognised internationally including recognition within the financial and investment sectors. While focused on volumetric benefits, non-volumetric benefits such as water quality or biodiversity can be built into the framework using 'complementary indicators' (see comment on the Wyre NFM above).

Volumetric water indicators are (measured in volume of water over unit of time):

Avoided runoff | Improved flow regime | Increased recharge | Maintained recharge |
Reduced consumption | Reduced runoff | Reduced withdrawals | Volume captured |
Volume provided | Volume treated

<https://www.wri.org/research/volumetric-water-benefit-accounting-vwba-method-implementing-and-valuing-water-stewardship>

VWBA is being used by Diageo (so has some profile already within the whisky distilling industry) and is also used by large scale global corporations such as Coca Cola – who brand VWBA as 'Replenish'. In 2021, Diageo's 11 distilleries along the River Spey became the first to achieve the International Water Stewardship Standard (AWS Standard). SRUC and Diageo are working with Nature Scot is also interested in developing Landscape enterprise Networks in Scotland and have contributed to funding a national Landscape Enterprise Networks Coordinator.

The Replenish branding has been adopted by the Rivers Trust (working with Coca Cola) for a series of recent projects in the North East and South East of England.

<https://theriverstrust.org/our-work/our-projects/replenish-2020-2023>

Note - the Rivers Trust stressed that they see Replenish as a means to an end and that their use of this approach needs to be contextualised to prioritise river restoration and NbS – otherwise results could be achieved through grey infrastructure solutions.

Other distillers are also working on volumetric benefits. For example, Beam Suntory are committed to sustainable water management – largely due to international experience and commitments (as well as business sense). Suntory have a 'water sanctuary' in Japan and Beam heavily involved in afforestation in NY State. Their approach is based on the concept of 'Proof Positive' – aiming to replenish twice the amount of water that they use – replenishing groundwater but also holding water on the surface. They are not looking at accreditation (this is about their business sustainability) nor at carbon offsetting (they are aiming to reduce C in their processes rather than offset). They are looking holistically at catchments (and recognising that they are all different) and are interested in water supply sustainability but also biodiversity and water quality. In the case of Beam Suntory, their key metric is peat recovery (area of active Sphagnum), with a target of 1300ha by 2030 – this is

based on the amount of peat that they use globally. This includes the development of a peatland sanctuary linked to the Ardmore distillery.

In terms of measurement, they are working with the James Hutton Institute to monitor water table, vegetation change and invertebrate populations while monitoring water intake and use.

Work in this area is also taking place with Glenlivet, Chivas and others. Andrew McBride – who is working closely with Beam Suntory and other distillers – indicated that the Scottish Whisky Association is keen to see more activity in this area.

Other food and drink sectors in Scotland also have an interest in water stewardship – most notably through the impacts of water scarcity on agriculture. Nestle has been a key partner in bringing together a Landscape Enterprise Network (LENs) in the South West of Scotland along with the Dairy Nexus which is focused on the dairy sector’s reliance on environmental quality (including water). A Sustainable Growth agreement⁴ was reached with SEPA to trial the approach in Scotland in 2020.

In parts of England most at risk from drought, the concept of water neutrality is emerging. This is analogous to the nutrient neutrality requirements for priority catchments. In water neutrality areas, developments must show that they are not increasing the rate of water abstraction above existing levels. Where this is not possible, developments can offset their water use by providing water saving measures for local schools, community buildings etc. It remains to be seen whether this approach leads to water stewardship credits and trading similar to the case for nutrients.

It is also worth noting that there is currently a strong pushback against both nutrient and water neutrality schemes from developers. Natural England are being accused of preventing housing developments from happening by increasing costs.

Multifunctional schemes and projects

It is important to note that most NbS schemes and programmes that were looked at are aiming to deliver multiple outcomes and benefits. The detail of interventions and the metrics in use are determined by the relative prioritisation of these benefits. Indeed, in some cases, the ‘additional’ benefits are recognised but not explicitly quantified or valued.

⁴ [Scottish Environment Protection Agency \(SEPA\) signs Sustainable Growth Agreement with Nestlé UK and Ireland | Media | Scottish Environment Protection Agency \(SEPA\)](#)

The **Greater Manchester Authority** is building portfolios of investable NbS projects across the city region. These are multifunctional, multi benefit projects but, at this stage of market development, are frequently being targeted primarily on the measurement, valuation and funding of one key outcome – generally via carbon or biodiversity credits.

<https://gmenvfund.org/>

In other cases, a range of outcomes/benefits have been modelled and are being monitored (either directly or through proxies) with a view to selling these benefits. For example, as already highlighted, the Wyre NFM project achieved the funding needed to establish and run the scheme by identifying and ‘selling’ different benefits to a range of stakeholders.

Scottish Water (SW) are funding peatland restoration in several areas (particularly in the Western Isles), paying for contributions to the following outcomes:

- Water quality – colour, organic matter (TOC)
- Carbon Capture – this involves Scottish Water, landowners and 3rd party buyers
- Yield – ‘flattening flashes’ (reducing peaks and troughs) *
- Drought Resilience – creating a ‘water bank’

* SW report that they are experiencing challenges with this outcome due to a lack of evidence

Section 3 CHALLENGES AND ISSUES

3.1 Challenges of developing and using water metrics and standards

Modelling

All the systems that are in use for water benefits require robust baselining of current conditions and modelling of the impact of proposed NbS interventions. This is complex and time consuming and several interviewees contrasted this with the relatively simplicity of calculating carbon credits. This is, in part at least, due to the variability of hydrological and hydromorphological systems and the perceived need to develop catchment-specific understanding of required actions and anticipated outcomes.

There are, however, problems inherent in any modelling-based approach. Establishing baselines across all key variables takes time (several seasons to many years) and this is time that we do not have in a period of climate and nature emergency. Modelling is also expensive and introduces uncertainties. Could a suite of ‘generic’ NbS interventions and predicted outcomes be developed to reduce (but not eliminate) the need for detailed catchment/intervention specific modelling. An example of this is the approach proposed in the emerging Woodland Water Code. Research has identified the effectiveness of the width

of riparian woodland buffers which allows assumptions to be made about reductions under different scenarios. This could provide the basis for a calculator similar to the carbon codes.

Attribution and measurement of impacts

It is often difficult to demonstrate direct impacts of NbS on river systems of water supply catchments – particularly when NbS interventions are currently only a small part of any catchment and many of the impacts occur over extended periods of time. Additionally, the high cost, and expense of monitoring can make it prohibitive. This requires simple approaches which could be used to verify the benefit provided. Many projects rely on proxies and indicators (based on scientific evidence and logic modelling) alongside direct measurement.

Practicability

Interviewees, and the working group, indicated the need to balance requirements for modelling, measurement and validation with enabling landowners and managers to participate in the market. This cannot, however, be at the expense of the credibility of NbS schemes. Any approaches to making the system more straightforward must still take account of the need for scientific and financial rigour. We need to find the right balance – one that is acceptable across stakeholder groups.

The **use of generic models, calculators and proxies/indicators** stands or falls on the acceptance of regulators (or, where they exist, code administrators). It is essential, therefore, that approaches are developed which are acceptable to these key stakeholders while remaining practical and viable for schemes and landowners.

Field advisors play a key role providing expertise to identify the most valuable interventions for any scheme. Ultimately, this may be more important than modelling in generating confidence in proposed solutions.

Stacking, additionality and trade-offs

Many of the schemes consulted were facing difficulties where carbon sequestration was part of a wider suite of identified benefits. Much of this relates to the challenges of demonstrating additionality (to justify funding or investment) when the Carbon Codes and those marketing UK carbon bundle benefits to justify relative unit prices. This is the basis of the 'charismatic carbon' concept – *'it costs more but look at all the other things you get'*.

In this light, it is worth highlighting the direction of travel with the Woodland Carbon Code and Peatland Code.

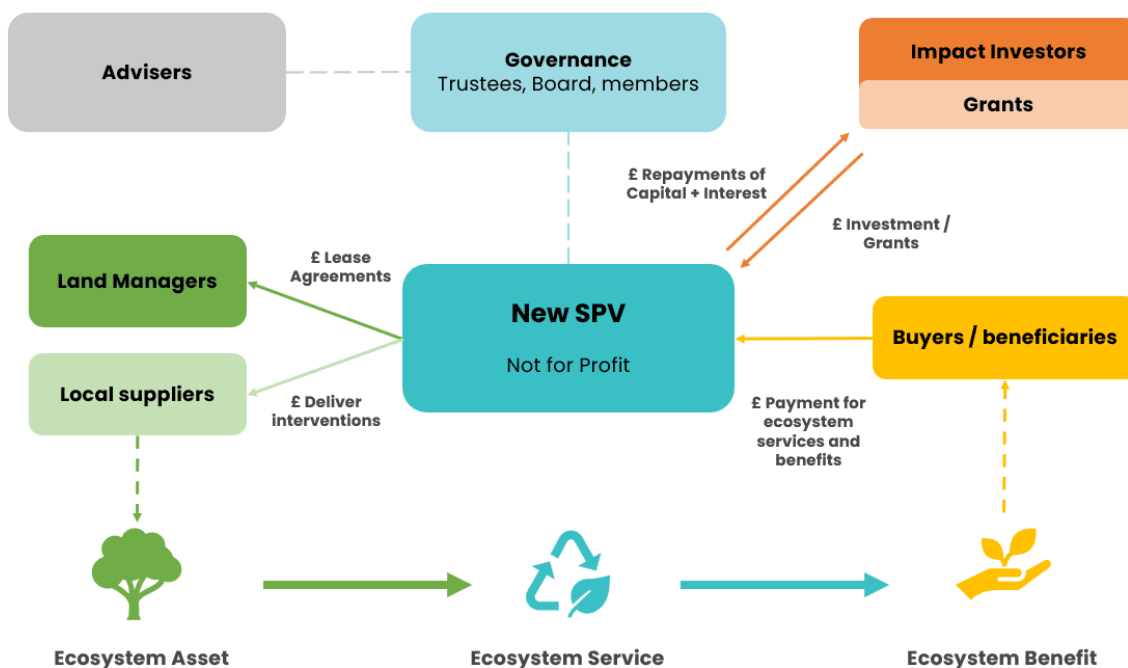
WOODLAND CARBON CODE	PEATLAND CODE
<p><i><u>Current Situation: Bundled Credits/Units</u></i> With the Woodland Carbon Code, wider benefits of woodland creation projects are ‘bundled’ with the carbon unit when they are sold (i.e. the landowner sells the carbon unit with the other benefits of the project ‘attached’ or included).</p> <p><i><u>Future Possibilities: Stacked Credits/Units</u></i> In future, it may be possible to ‘stack’ voluntary credits/units generated from a woodland creation project (e.g. where credits/units are generated for other ecosystem services such as biodiversity or water), provided:</p> <ul style="list-style-type: none"> <input type="checkbox"/> There is a credible voluntary standard/methodology for other ecosystem services <input type="checkbox"/> These standards/methodologies are approved for use by the WCC Secretariat <input type="checkbox"/> All income streams are declared in the WCC Cashflow Spreadsheet <input type="checkbox"/> Claims made are clear and explicit. 	<p><i>“With the Peatland Code, wider benefits of peatland restoration projects are ‘bundled’ with the carbon unit when they are sold (the landowner sells the carbon unit with the other benefits ‘attached’).</i></p> <p><i>Version 1.2 of the Peatland Code stated that “in the future, it may be possible to stack” Peatland Carbon Units with payments for other ecosystem services, and laid out some of the conditions that would need to be met for this to be possible.</i></p> <p><i>Although stacking is not yet possible in Version 2.0, work is underway in collaboration with the Woodland Carbon Code, the UK Land Carbon Registry and each of the devolved UK Governments to make stacking operational in a future version of the Code. Mechanisms are needed to ensure stacking does not compromise the integrity of the market, in particular the requirement for projects to demonstrate additionality. A programme of work is planned to operationalise stacking, including:</i></p> <ul style="list-style-type: none"> <input type="checkbox"/> The existence of credible voluntary standards for each ecosystem service in the stack, and where these do not yet exist, the development of methods that could be used by the Peatland Code Executive Board to approve their use with Peatland Code projects; <input type="checkbox"/> Methods for distinguishing bundled projects (in which other ecosystem services are sold as part of a bundle of benefits alongside the carbon) from stacked projects for buyers, including mechanisms to show this on the UK Land Carbon Registry and ensure checks are made between registries to avoid double-counting, so that claims are clear and explicit.”

The Working Group highlighted that, as metrics and markets mature, there is a need to understand and plan for the trade-offs between the different ecosystems services being targeted and the increasing risk of competition between emerging and existing codes – is there a risk that schemes will focus on the ‘easiest’ or most profitable code to the detriment of other outcomes and we will lose multifunctionality?

3.2 Delivery structures

Dan Hird, Jim Airtton and Alex Adams stressed the importance of having a clearly established delivery model with an identified body responsible for attracting investment and overseeing activity.

Catchment scale delivery model (example from the Wyre NFM)



Jack Spees highlighted that the Ribble Rivers Trust has established catchment cooperatives to bring together small private landholdings to give them a voice in the ‘land managers’ component of this model. Increasingly RRT are considering sub catchment cooperatives to better represent perceptual geographies and to ensure that solutions are responsive and meaningful.

Section 4 Key observations

4.1 Relative absence of drivers in Scotland

When compared to England, water-related ecosystems service markets in Scotland are relatively immature and few of the necessary regulatory or economic drivers are in place.

As already stated, nutrient neutrality is only being addressed in limited contexts in the area around Loch Leven. Natural Flood Management is happening in some catchments but is primarily grant-aided or publicly funded. There are examples of Scottish Water supporting multi-benefit peatland restoration for a range of water benefits as well as carbon and biodiversity but this is one of the few 'buyer' relationships that currently exist in Scotland. The National Parks are working on wide-ranging landscape scale interventions which include water benefits but are struggling to attract private investment – other than from key private landowners. Water scarcity for agriculture is a relatively new concept for many in Scotland but is predicted to become more of an issue for the east of the country and for businesses relying on private water supplies elsewhere. SEPA and Scottish Water have used a One Planet Choices approach to develop partnership working around water availability in NE Fife.

The one exception is the interest in water security from distillers. Diageo are using the VWBA approach across their international business and Suntory Beam are using internal systems and measures to prioritise water stewardship. Other companies such as Chivas and Glenlivet are working with academic institutions to explore water issues and develop NbS to their issues of water availability and quality.

While the relative immaturity of systems and approaches in Scotland is disappointing, it does allow the working group to prioritise activity in the areas and with the stakeholders who are most ready to engage.

4.2 Evidence/research needs

It is clear from across the interviews and from wider discussions that there is still a lack of (accessible) evidence of the water related outcomes from key NbS interventions. This would be a very good time to review the existing evidence base, address any clear gaps in evidence and to ensure that all the relevant evidence is available to those who need to use it in planning, delivering, monitoring and validating NbS interventions.

4.3 Helping potential players to engage

If we are seeking to move the development of NbS markets forward through the development and agreement of metrics and standards, action is also needed to make the

system as straightforward and predictable as possible for all the key stakeholder groups. This will require some or all of the following:

Funders and Investors

- Portfolios of potential projects (funders, philanthropic, early investors)
- Portfolios of investable projects

Scheme developers/buyers

- Regulator and sector agreed guidance on:
 - Project targeting (priority areas and opportunity mapping)
 - Appropriate use of modelling and other methods to forecast impacts and benefits
 - Measuring impact
 - use of monitoring
 - acceptable use of proxies and indicators

4.4 Governance

There needs to be a nested approach to governance which enables work at Scotland, regional, catchment and sub catchment levels. This can, and where possible should, be based on existing/emerging partnerships such as One Planet Choices and LENS but other models and structures are also possible. There is also a need for trusted and accepted hub bodies to coordinate investment and action at an appropriate scale. Discussion is needed to identify what national governance is required (at the very least, stewardship of metrics, standards and guidance is likely to be necessary).

4.5 Additionality and stacking

The desirability of stacking benefits – both to make the case for water outcomes and to increase the viability of NbS schemes – was a common theme across the research interviews. Public sector funding, existing carbon codes and emerging codes for biodiversity all require proposed schemes to demonstrate additionality.

Additionality - Criterion stipulating that project-based Greenhouse Gas (GHG) reductions shall only be quantified if the project activity “would not have happened anyway”. The Peatland Code utilises legal, financial and barrier tests to determine additionality.

[definition from Peatland Code].

As the ‘non-carbon’ metrics and markets develop, work is still needed on additionality and stacking and developing robust and acceptable methodologies to recognise multiple outcomes from ‘single’ interventions – it is possible to envision a situation where different buyers are interested in the carbon, biodiversity and water benefits accruing from a specific woodland or peatland scheme for example; or a situation where different buyers are interested in different aspects of the water outcomes (water quality, water supply, flood management). There is also a need to explore how multi-outcome investment portfolios can

be developed and marketed – especially given the feedback that investors are currently primarily interested in ‘charismatic carbon’ approaches to wider benefits.

Section 5 RECOMMENDATIONS

R1 Establish a Water Outcomes Technical Group
R2 Explore market requirements with funders, investors and buyers
R3 Understand research/evidence needs around NbS and water outcomes
R4 Support the development of guidance and tools
R5 Support the development of market drivers in Scotland
R6 Develop Scottish Demonstrators
R7 Promote the establishment of national, regional and local governance and delivery structures for NbS at catchment scale

Recommendation 1 – Establish a Water Outcomes Technical Group

Note: this could be linked to the existing Technical Group for the Woodlands for Water Code

Remit for proposed Technical Group needs to include:

- catalysing the development of portfolios of projects at scale targeting key water outcomes
 - water quality (primarily nutrients, sediment and organic carbon)
 - water stewardship and key water abstraction uses
 - Natural Flood Management
- developing a disbenefits and trade-offs framework for ecosystems services to inform the use of existing and emerging metrics and standards
- developing an agreed and rigorous but practicable approach to calculating water outcome benefits from NbS interventions

Recommendation 2 – Further exploration of market requirements with funders, investors and buyers

R2.1 Follow up this scoping study with targeted engagement of key funders, investors and buyers to better understand their drivers

R2.2 Explore the issues of additionality and stacking with funders, investors and buyers

Recommendation 3 – Understand research/evidence needs around NbS and water outcomes

R3.1 Begin with a detailed review of existing evidence on water benefits for each of the key habitat types and key ecosystems services. For example:

- underpinning water metrics and standards that could apply across all habitats, such as for sediment and pesticides, as well as biological aspects of water status
- balance of water retention, flow rate slowing and evaporation losses for all habitat types within NbS (this is essential for volumetric water benefit accounting)
- peatland condition impacts across all water outcomes – NFM, water retention, water temperature, water quality etc.

R3.2 Carry out a collective review of existing and planned measurement and monitoring networks and systems.

- What is being measured?
- At what scale and geography?
- How can this assist in the development of metrics and standards – and the monitoring and verification of the impact of schemes?

R3.3 Commission new research where this is needed - using existing structures and agreements such as RESAS and the various Hydro Nation programmes.

R3.4 Support research into the greater use of remote sensing (backed up by appropriate ground truthing to provide confidence) as a means of making monitoring more achievable.

R3.5 Explore existing ‘wider’ models and how their use promotes or disincentivises NbS [for example, if only extreme flood events are being considered then NbS may only show small impacts whereas modelling more ‘regular’ events will highlight the potential for NbS to contribute to NFM]

Recommendation 4 – Support the development of guidance and tools

R4.1 Support the proposed evolution of the Woodland Carbon and Peatland Codes (particularly in relation to stacking benefits) and the development of the Woodland Water Code

R4.2 Use current activity (including SEPA’s review and updating of its river basin modelling and target mapping and SW’s drought action planning) to:

- consider how SEPA/SW etc. models and maps can be used by others as a starting point for planning solutions for water – including the identification of priority areas and locations for specific NbS and the development of portfolios of investable NbS projects
- review existing tools and approaches to determine their value in a Scottish context and, if necessary, promote the development of new or hybrid tools better suited to Scotland

- explore and catalyse the development of an agreed and rigorous approach to calculating water outcome benefits from NbS interventions balancing the need for ‘generic’ solutions and measures while addressing catchment specificity, retaining scientific and financial validity and not overwhelming those trying to deliver NbS. Including:
 - the setting of minimum standards and endorsement of acceptable metrics and calculators similar to those being developed for soil carbon codes
 - guidance on using modelling, direct and remote monitoring
 - guidance on the use of field advisers

R4.3 Promote the building of robust and planned monitoring into investment models and pricing - making the system as straightforward as possible, looking for standardisation where practicable while ensuring it remains robust and credible.

Recommendation 5 – Support the development of market drivers in Scotland

R5.1 Explore policy and strategy around key water outcomes with Scottish Government, key agencies and COSLA/Improvement Service⁵

- nutrient neutrality/nutrient trading
- water scarcity/water neutrality
- Natural Flood Management

Recommendation 6 - Develop Scottish Demonstrators

R6.1 Identify and support the development of a series of Scottish demonstrator/pathfinder case studies relevant to each of the key water outcomes. The case studies should:

- explore the value and acceptability of metrics and standards
- test tools and approaches in use elsewhere to determine their value in a Scottish context
- explore the range of options for local delivery models and responsibilities
- explore funder, investor and buyer interest
- focus on the areas/sectors where there is greatest buy in or strongest drivers, for example:
 - emerging LENS in Speyside and Loch Leven
 - areas under greatest drought risk – especially those covered by SEPA’s existing work with agricultural partners (e.g. One Planet Partnership in NE Fife)
 - Scottish Whisky Association members
 - Key salmon rivers (with Fisheries Management Scotland)
 - Blue-green drainage solutions in Edinburgh and Glasgow

⁵ <https://www.improvementservice.org.uk>

Recommendation 7 – Promote the establishment of national, regional and local governance and delivery structures for NbS at catchment scale

R7.1 Work on Governance structures should be discussed at Scottish level via the Natural Capital investment Programme work stream to ensure that it encompasses other developing metrics such as the biodiversity metric.

R7.2 Use the proposed demonstrators to explore and promote the range of regional/catchment/sub catchment governance models that can be used in Scotland.

R7.3 Explore the potential to develop a (preferably automated) system which can spatially map which organisations and entities are coordinating investment and action in each catchment and track who is paying for what outcomes in any catchment.

R7.4 Establish clarity on which organisations are responsible for advising and updating water metrics.

Appendix 1 List of interviews and discussions

Informal, virtual interviews (based around the questions in Appendix 2) were carried out with:

Alex Adams, The Rivers Trust
 Jim Airton, United Utilities
 Mike Cottam, Cairngorms National Park
 Andy Ford, Cairngorms National Park
 Matthew Hays, Bidwells
 Dan Hird, Nature Finance
 Eilidh Johnston, SEPA
 Renee Kerkvliet-Hermans, IUCN UK Peatland Programme
 Dawn Lochhead, Scottish Water
 Andrew McBride, Land and Habitats
 Tom Nisbett, Forest Research
 Krista Patrick, Greater Manchester Authority
 Ruchir Shah, Scottish Wildlife Trust/Riverwoods
 Jack Spees, Ribble Rivers Trust
 Jared Stewart, Scottish Water
 Brendan Turvey, Nature Scot
 Professor Nigel Willby, University of Stirling

In addition, working group members added their experience and views on the questions and report drafts.

Working Group Members:

Rosie Brook, Forest Research
 Deryck Irving, Hydro Nation Chair
 Renee Kerkvliet-Hermans, IUCN UK Peatland Programme
 Brian McCreadie, SEPA
 Nicola Melville, SEPA
 Tom Nisbet, Forest Research
 Dr Amy Pickard, UKCEH
 Brendan Turvey, NatureScot
 Prof Andrew Tyler, Hydro Nation Chair, University of Stirling
 Gregory Valatin, Forest Research
 Mark Wilkinson, JHI

Insights were also drawn from:

- SEPA's workshops (targeting and quantifying; monitoring and verification)
- the Reconciling Floods and Droughts crucible event hosted by the Hydro Nation Chair

- the Scottish Government's Regional Economic Impacts of Natural Capital Investment workshop
- BGI Partner Ecosystem meetings chaired by Scottish Water

Appendix 2 Consultation interview questions

Q1	<p>Which nature-based solutions (NbS) are included in your scheme/programme? <i>For example, peatland restoration, woodland creation, wetland creation/restoration, river naturalisation</i></p>
Q2	<p>Which water-related ecosystems services are you valuing/trading? <i>For example, water quality improvement, natural flood management and drought mitigation, biodiversity enhancement</i></p>
Q3	<p>How are you evidencing the impact of NbS interventions? <i>Are you measuring the scale of intervention (i.e., ha of restoration) or the impact of interventions on water quality etc.? What metrics are you using?</i></p>
Q4	<p>How are you using measures and metrics to drive investment in ecosystems services/NbS? <i>How are you valuing and trading ecosystems services? What returns are you offering to investors?</i></p>