

Appraising governance factors that shape Nature-Based Solutions



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Across the world, implementing Nature-Based Solutions (NbS) has become an important topic, including for catchment management. NbS entails managing nature to tackle societal challenges, and so offer the potential to transform how we manage our natural resources. However, achieving this transformative potential is not easy. In the past few years, many scholars have noted various issues that can impede and enable NbS; these issues include what projects managers can do, but that also go beyond what individual site or project managers can achieve by themselves.

This briefing provides a precis of what is known about governing NbS, and identifies implications for catchment management in Scotland. Its conclusions emphasise the value of supporting partnership working in order to allow for NbS projects that involve multiple stakeholders, tackle multiple goals and typically involve multiple activities. Monitoring and updating these projects should be planned to reflect these multiple objectives and viewpoints. Delivering such transformative NbS requires the participation of sectors of society; but the public sector has a key role to play, by supporting partnerships, and strengthening efforts for policy coherence.



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1 Why was this briefing written?

NbS are often conceived and commissioned in terms of specific projects (see section 3). Good project governance is important to foster compliance with the ethos of NbS and help achieve the full range of intended outcomes. However, the ability to fully deliver the goals of those projects often depends on other factors, and which might affect their ability to deliver multiple benefits at scale. Given that NbS are not easily or quickly delivered (Dunlop et al., 2024), especially at scale, it is important to understand more about these external factors. Improving NbS needs to balance attention to both internal and external factors: this briefing therefore reviews what is known about both.

2 What is this briefing based on?

This briefing is based on a literature review. In the past decade there has been strong growth in attention to the governance of NbS, both within literature published by academics and by non-governmental organisations. Particularly notable is the creation and endorsement of the Global Standard by the International Union of Conservation (IUCN, 2020b). This is reflected by attention to factors that shape, constrain and enable NbS, as illustrated by Figure 1. Therefore, it is appropriate to collect and synthesise messages from this literature.

NbS relates to a range of pre-existing practices such as integrated catchment management but also other settings and domains (Nesshöver et al., 2017), such as tackling urban over-heating and air pollution through green infrastructure. This review is not solely based on the literature focused on water and catchment-based settings; nor solely Scotland. However, there has been a preference to building on sources derived from European settings, which are expected to have some similarities with the Scottish context. The focus has been on authoritative sources synthesising challenges and barriers that reduce or constrain the implementation of NbS, as well as those reporting opportunities and recommendations to enable and improve NbS. The final part of this review briefly considers specific implications for catchment-based NbS in Scotland.

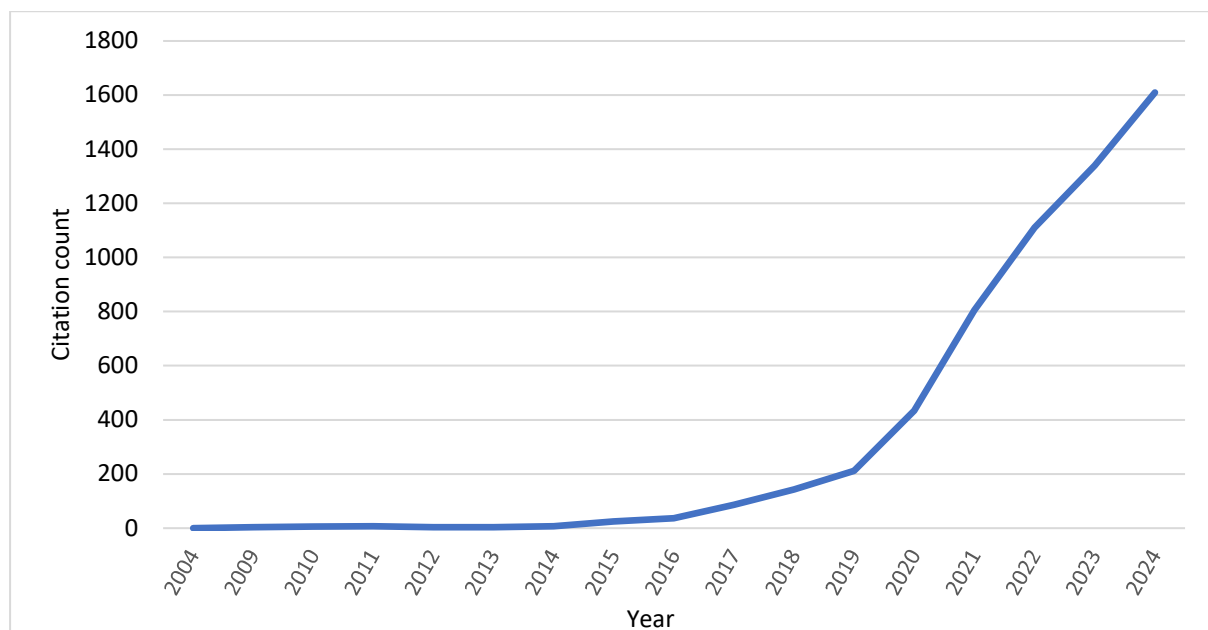


Figure 1 Count of citations returned in Google Scholar for the term 'governance' and 'Nature-Based Solution' or 'Nature Based Solution' over a 20-year period.

3 What are Nature-Based Solutions (NbS)?

There are many definitions and versions of NbS currently in use (Short et al., 2019). Our definition of NbS is rooted in the internationally-discussed and accepted IUCN Global Standard:

“actions to protect, sustainably manage, and restore natural or modified ecosystems, which address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits.” (IUCN, 2016).

NbS is also endorsed in Scotland, following this definition (Pakeman et al., 2021). Most definitions, including IUCN’s, emphasise that actions should aim to tackle multiple problems – both societal and environmental - and ideally multiple goals within those categories. It typically entails the involvement of citizens and other groups who have a stake in the problems to be tackled and goals to be achieved. However, the definition leaves open a wide range of potentially-relevant examples and initiatives, with variation in the number and type of stakeholder groups to be involved, and the types of interventions to be carried out (Eggermont et al., 2015). Achieving such a vision is generally thought to imply transformative change in how society relates to and manages nature (Palomo, 2021).

It is not usually defined precisely what scale or scope of actions ‘count’ as NbS¹. However, they must be sufficient to deliver multiple benefits. Logically, very small-scale site-specific interventions or one type are unlikely to deliver significant changes in ecosystem service delivery. However, if the work is anticipated to result in significant changes in more than one ecosystem service are anticipated, that is sufficient. For, planting a single tree in a town is not a NbS – but it could be part of NbS if many trees are planted, with their location and species chosen to deliver benefits to air temperate and quality. It is also possible for intensive intervention on small site or issue to deliver multiple benefits and count as NbS – this is often the case for urban-oriented initiatives, which are sometimes labelled as Blue-Green Infrastructure (Green et al., 2016). Such an initiative may be commissioned by or linked to strategic programmes that are broader in spatial or temporal scope.

As a result, we therefore do not define NbS as having a single ‘correct’ scale, but note there can be both strategic level NbS (which could include catchment-level concepts) and more project-level NbS (which could include a more specific suite of interventions specific to a particular subset of challenges, place or time). The project level is similar to what others such as Margerum (2008) calls the ‘operational level’.

In this briefing we consider those factors that shape both the strategic and operational level – and are typically beyond the direct control of a programme or project manager.

4 What is environmental governance?

Environmental governance encompasses all *“interventions aiming at changes in environment-related incentives, knowledge, institutions, decision making and behaviours”* (Lemos & Agrawal, 2006). Environmental governance brings attention to who and how decisions are made that affect the environment and our natural resources. Getting governance ‘right’ is essential if we are to see successful NbS that provide benefits for people and nature, and at sufficient scales; though it is important to recognise that even so, NbS cannot by themselves easily resolve all the challenges facing society (Seddon et al., 2020).

This term “governance” obviously sounds very similar to “government”; but governance not only includes the purposeful actions of state bodies, but also those of other groups, ranging from communities to businesses or NGOs. Thus, governance can happen not only at the national level but

¹ Please contact Kerry Waylen to know more about an earlier project deliverable focused on stakeholder analysis, for more discussion of scale in NbS.

also in other levels and settings. The types of levers or mechanisms used to influence the governance of nature (and so NbS) include regulations, but also incentives and guidance. Whilst nature-related organisations and mechanisms are an obvious focus for understanding environmental governance, other organisations and processes can also (potentially inadvertently) have a huge influence on the environment, shaping outcomes for nature and people. For example, many of the indirect drivers of change on Scotland’s biodiversity related to social and economic drivers (Pakeman et al., 2023). Thus we should expect any type of NbS to be influenced by a very wide range of factors, not only formal bodies and mechanisms set up to focus on nature.

Additionally, the term ‘governance’ is commonly used in terms of the project level, focused on ‘good’ principles for designing, organising and running projects. Conforming with these principles should complementary an enabling context, but is not quite the same.

For this reason, to avoid confusion between the different interpretations of ‘governance’, in the rest of this briefing we generally refer either to ‘project governance’ (for project level design factors, often controllable by project managers) or ‘external factors’ (wider factors that can enable or shape NbS, controlled by other actors).

5 What does good project governance look like for NbS?

For a project manager who seeks to promote and develop initiatives in line NbS, the IUCN Global Standard on Nature-Based Solutions should be the starting point (IUCN, 2020b) supplemented by guidance (IUCN, 2020a). The 8 principles of the Global Standard are designed to provide an essential guide to how to develop NbS that achieve the best possible outcomes for people and nature.

Figure 2 below shows those principles. There are 28 criteria nested under them, that describe the more specific issues that need to be given attention during project design and evaluation. Since these principles and indicators have been based on expert guidance and consultation from a variety of disciplines and professions, they should encapsulate the best ideas about good principles to work by, and advice for putting them into practice (Cohen-Shacham et al., 2019). They combine, for example, generic insights about good project design, guidance on stakeholder engagement and empowerment, and learning from past environmental management projects. Although NbS projects focus on working with nature – by definition – attention to the process of working with and for people are just as crucial, from the earliest stages. In other words, co-creation of NbS is essential (European Commission Directorate-General for Research & Innovation et al., 2023).

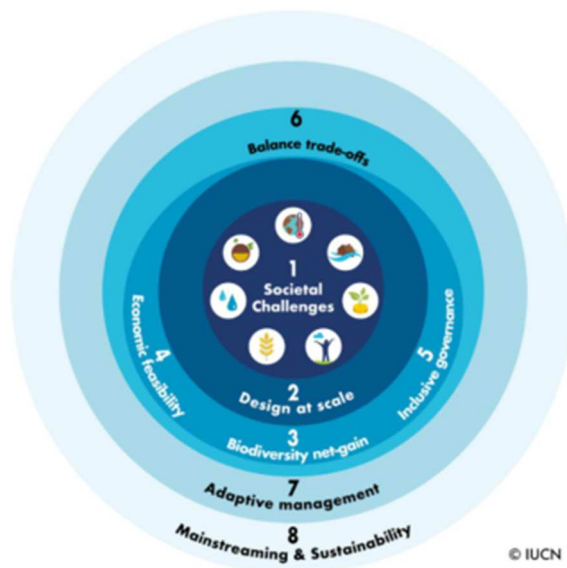


Figure 2 A visual summary of the 8 principles, taken from the IUCN Guidance supporting the global standard (IUCN, 2020a). These eight criteria that make up the IUCN Global Standard are all interconnected. Not shown in this diagram are that each criterion has 3 to 5 specific indicators nested under it: there are 28 indicators in total.

The IUCN have also provided a self-assessment tool that can be used to design or self-assess existing initiatives (IUCN, 2024). It is recommended that anyone seeking to start or strengthen an NbS project should download and use the self-assessment tool to help plan and appraise their progress in line. Doing so should help to embed good governance of NbS design.

The traffic light system

The traffic light system uses colours to indicate the status to which the potential NbS intervention meets a respective indicator. Each indicator has its specific scoring scale and scoring guidance for the selection of strong, adequate, partial, and insufficient.

How well the intervention matches to indicator

Strong	Adequate	Partial	Insufficient

The outcome of the self-assessment process is an extractable PDF report which displays information about the intervention, a visual representation of the self-scoring results at the indicator level using the traffic light system and the detailed responses for rationale and documentation for each individual indicator.

Below is an example of the visual representation users find in the online tool once the self-assessment is completed. The score users assigned for each indicator is presented.

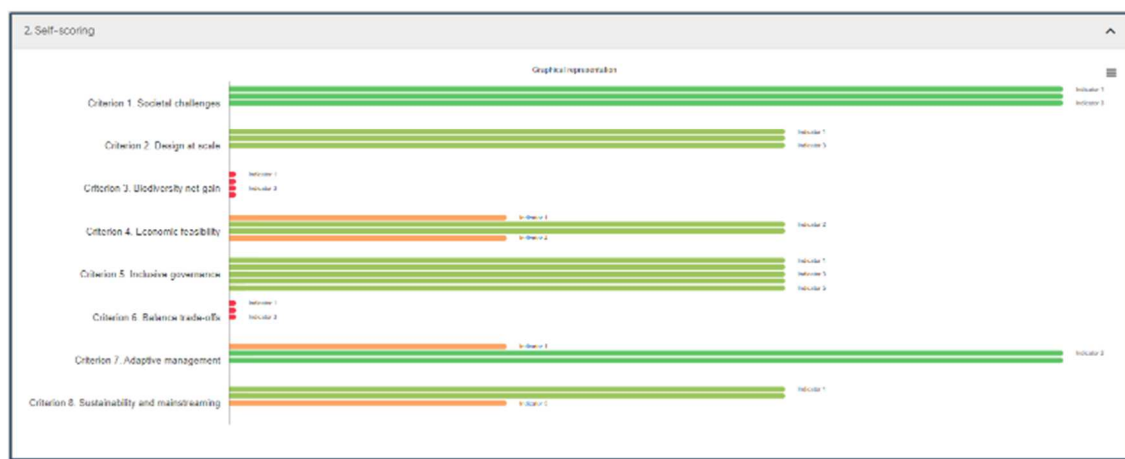


Figure 3 A snapshot of the traffic light signals provided for each indicator, together with an example of the visual representation of the performance against each indicator, generated upon use of the self-assessment tool. This diagram is an excerpt from support document for users of the IUCN Self-Assessment Tool at <https://nbs-sat.iucn.org/sites/nbs-sat.iucn.org/files/support/how-interpret-your-self-assessment-01022024.pdf>

It is notable that this NbS guidance is not explicitly framed in terms of the steps of a decision-making cycle. Other available guidance is more oriented in these terms: in particular, the Agile Initiative for Nature-based solutions (Agile Initiative, 2023). This can be helpful to consult, because it is impossible for a project team to simultaneously prioritise every issue and task. That said, it is also important not to consider certain issues as 'done' only at certain times, thus ignoring them at all other times. In particular, recent analysis linked to this project has identified and developed guidance on how stakeholder engagement needs attention in relation to every principle and phase of the project (Ibrahim et al., 2025). That paper provides guidance on specific issues to consider in relation to stakeholder engagement different principles and stages in NbS project development.

6 What external factors shape and enable NbS?

Others have recognised that progress in implementing NbS will be shaped by a wide variety of factors. The last five years in particular, have seen a proliferation of literature aiming to understand the progress and potential of NbS, observing barriers and challenges, as well as making recommendations for enabling and upscaling NbS². Across the literature, the recommendations are made based on case study reports and practitioner expertise derived from diverse settings (urban and rural) and different focal societal challenges (e.g. from improving water quality, to urban cooling).

Many challenges and barriers are reported as constraining ability to plan NbS, the progress of NbS and the scale of NbS. Although many sources note such challenges, we highlight Dorst et al. (2022) and Nelson et al. (2020) as providing a good overview and explanation of the range of issues encountered. The problems highlighted, range from: limited collaborative governance; limitations in data and awareness, often related to partial and short-term monitoring; low private sector engagement; competition over space and land; insufficient resources and undeveloped support in policy implementation; difficulties in integrating natural and built infrastructure; challenges in engaging citizens as well as private sector actors and other stakeholder groups; and inadequate attention to equity.

Recommendations for enabling NbS often mirror these problems. We have synthesised the range of activities recommended from some recent sources in Table 1 below. They are interrelated and provide a constructive – and perhaps daunting – overview of the range of activities that must be done to enable NbS. Many of the recommendations aim to improve the participation of communities and citizens as well as private sector actors in planning and achieving NbS; but (often implicitly) the recommendations are aimed at the public sector, who are conceived as a key organising force behind NbS.

One barrier noted above that perhaps is not so obviously addressed in these sources' recommendations is the issue of integrating natural and built infrastructure, a key issue when considering how to combine or select engineered and technological solutions to improving both water quality and flood risk issues.

Table 1 A range of recommendations made for enabling and upscaling NbS. The numbering and grouping of recommendations varies by source, the synthesis into ten factors is made by the author.

Enabling factor	Example of source
1. Collaborative coordinated governance: including coordination of policies but also connections across multiple institutional scales and sectors. Trusted facilitators and knowledge brokerage skills are essential: this may entail creating intermediaries and stimulating cross-sectoral partnerships if they do not already exist.	(Ashton & Bradshaw, 2023) (Martin et al., 2021) (Dorst et al., 2022) (European Commission Directorate-General for Research & Innovation et al., 2023)
2. Provide clear public mandate and narratives about how NBS support established strategic priorities e.g. for health	(Dorst et al., 2022)
3. Introduce specific regulations such as for No Net Loss, reflected in duties on public bodies to support NbS in	(Tozer et al., 2022) (Breil et al., 2023)

² Upscaling NbS refers to doing more activities, across greater spatial scales, to deliver greater benefits (e.g. UNEP, 2022).

procurement and contracting and in rules affecting others e.g. building regulations.	
4. Foster internal coordination and silo-breaking <i>within</i> public sector organisations.	(European Commission Directorate-General for Research & Innovation et al., 2023)
5. Where private benefits are generated by NbS, support favourable market conditions, e.g. through support for nature-based value chains, tax cuts, subsidies for NbS-related activity, under-writing risk, green investment products.	(Ashton & Bradshaw, 2023) (Martin et al., 2021) (Tozer et al., 2022) (Breil et al., 2023)
6. Coordinate with existing investment cycles and bridge public and private sectors to enable co-funding. Expect that private sector investments may be more likely for certain types and scales of NbS, whereas public sources help drive large-scale NbS. Consider how maintenance costs will be met.	(Tozer et al., 2022) (Breil et al., 2023)
7. Improve valuation models to help justify NbS. Promote green certification schemes for NbS-compatible products.	(Tozer et al., 2022)
8. Improve data and monitoring, which can involve commissioning new monitoring but also use of existing data sets. Provide financial incentives for monitoring as well as implementation. Strengthen use of monitoring data for evaluation and learning.	(Ashton & Bradshaw, 2023) (Tozer et al., 2022) (European Commission Directorate-General for Research & Innovation et al., 2023)
9. Seek and encourage pro-NbS interest and coalition groups. Build the skills and capacity of actors, especially community groups but also under-involved groups such as insurance companies	(Martin et al., 2021) (European Commission Directorate-General for Research & Innovation et al., 2023)
10. Establish demonstration projects to build shared learning and confidence-building in NbS. Consider planning short-term actions as well as longer-term actions, to maintain motivation.	(Tozer et al., 2022) (European Commission Directorate-General for Research & Innovation et al., 2023)

7 What are the implications for catchment-based NbS in Scotland?

The above recommendations should be widely relevant, but applying them in specific settings requires attention to pre-existing practices and ideas. This section provides some ideas for consideration for enabling catchment-based NbS in Scotland.

Plan for multiple types of change Research and recommendations for catchment management have often pioneered integrated and systemic approaches. This means some recommendations above may already feel familiar to someone who has experience of working on topics related to catchment management – for example, the need to build collaboration and shared learning for catchment management (Allen et al., 2011). The good practice principles for catchment management developed by Marshall et al. (2010) are still relevant and relate to how NbS projects can be designed. Similarly, when considering external barriers and opportunities, the barriers and opportunities for mainstreaming natural flood management identified by Wingfield et al. (2021) resonate with many of the recommendations identified in table 1. The familiarity of the challenges and recommendations builds confidence in their salience; yet also suggests they are not easy to put into practice. Therefore targeted efforts will be needed, balancing attention across all issues (Tozer et al., 2022) avoiding any temptation to focus just on those measures which are easiest to implement in

the short-term. Doing so is likely to lead to different approaches that are mutually reinforcing (McGuirk & Dowling, 2021) so building shared capacity and recognition for the legitimacy of NbS. The leverage points literature, which focuses on how to achieve transformative change for sustainability (Abson et al., 2017) has identified a tendency to favour ‘shallow’ leverage points (interventions that are relatively easy to make) whilst avoiding the ‘deeper leverage’ points (changes which are more difficult to tackle but have greater potential for transformation, often relating to significant institutional and cultural changes). Framing discussions about change in terms of leverage points may help to identify the multiple changes needed, and also the ease or difficulty of making changes and how they will be achieved.

Strengthen efforts for policy coherence In Scotland, there are already many policies and practices that affect catchment management, notably River Basin Management Planning to improve water ecology, and Flood Risk Management focused on managing significant flood risks. NbS is not explicitly a policy goal, although the need to consider multiple benefits from water systems, and protect the ecosystem function are recognised, which is in line with the ethos of NbS. Efforts have already been made to improve the coherence of the implementation of these policies, though integration is far from complete (Waylen et al., 2019). Other policies not focused on water are also significant influence over wider catchment systems, especially agricultural policies (Blackstock et al., 2024) and also development planning in urban areas. Further work is needed to improve the coordination of policy implementation across policy domains (Blackstock et al., 2021) which may entail more attention to the detailed work of those charged with policy implementation (Blackstock et al., 2023), beyond high-level rhetorical support for coherence.

Support partnership working We should expect that the public sector will remain a key organising and driving force for working with nature (zu Ermgassen et al., 2024). However, for specific NbS projects it is nearly always beneficial for trusted intermediaries or brokers to help coordinate actors and build capacity: and it is important that such brokers are not regarded as strongly sectoral or biased. Therefore, public sector agencies may not best-placed to take on this role, but should expect to resource and participate in partnership working. No catchment or landscape-level body can be expected to resolve multiple challenges all by itself (Waylen et al., 2023), but such bodies, where they exist, could be well placed to take on such a brokerage or intermediary role. The Scottish Government does not presently give formal support to catchment-level partnerships across Scotland, though it does support the Eddlestone project within the Tweed catchment³, and enables Regional Land Use Partnerships⁴. It is worth considering if models such as England’s Catchment Based Approach⁵ might help support holistic inclusive catchment management in line with NbS.

Encourage cross-societal involvement with nature The involvement of a range of societal groups and sectors is essential to build durable support for NbS, and the capacity and resources to enable it. The existing work of environmental education and ranger services across Scotland may provide one basis for encouraging societal engagement with nature. Ongoing work within this project is exploring how and when citizens and small businesses may support NbS. Other research projects such as JHI-D4-1 People and Nature⁶ may also provide reflections on this broad challenge.

Support, celebrate and strengthen NbS-related initiatives Scotland already hosts a variety of initiatives which are related to NbS, although not always using the terminology, or only partially

³ <https://tweedforum.org/our-work/projects/the-eddleston-water-project/>

⁴ <https://www.gov.scot/policies/landscape-and-outdoor-access/land-use/>

⁵ <https://catchmentbasedapproach.org/>

⁶ <https://sefari.scot/research/projects/people-and-nature>

reflecting the eight principles of the IUCN Global Standard. As one example, the 10,000 Raingardens Initiative⁷ works to establish urban gardens that collectively reduce risks of flash flooding but also improve water quality, support urban wildlife and improve amenity for local residents. Such initiatives can be encouraged to use the IUCN Self Assessment Tool (IUCN, 2024) help reflect and strengthen their practices. Recognising and promoting the strengths of these different initiatives – whilst not avoiding discussion of weaknesses - can provide examples that can inspire and build confidence in actors not already involved in NbS.

Promote monitoring and learning Monitoring of NbS should reflect all the principles of NbS (Carvalho et al., 2022). In the past, monitoring in environmental management has often focused on biophysical parameters, so adjustments may be needed (Waylen & Blackstock, 2017). Citizen science could assist in strengthening monitoring, as well as strengthening citizen involvement and capacity, as long as the citizen scientists are trained and fully embedded and empowered as part of the work (Giardullo, 2023). It is also crucial that the results of monitoring are evaluated and used to reflect and learn about NbS, not only at the project but also the programme level. This can lead to changes in the design of specific initiatives, but also in learning about the enabling factors as reviewed here.

8 What may the future look like?

NbS are clearly not easy to implement at scale. However, an international literature provides a coherent view about typical challenges and needs in order to enable, upscale and improve NbS, with implications both for project managers and for others who seek to enable and support NbS. Therefore, there is no reason to delay in making specific efforts to interpret and apply all these ideas in Scotland. Given our existing experiences in catchment management in Scotland, as well as the growing academic understanding of NbS, we should be strengthening how we work with nature to tackle societal challenges.

That said, because implementation of NbS is still in its infancy worldwide, so far the literature on barriers are often derived from experience, whereas ideas about enabling factors are more often based on logical reasoning and expert insight: therefore in future years it may be useful to review how views on this change. Similarly, it will be important to track emergent insights and knowledge gaps from beyond Scotland (as recently summarised by Dunlop et al., 2024). As our understanding of practices as well as the NbS concept improves, it may be productive to reflect in terms of progress transformations (Carmen et al., 2024) to identify further opportunities to achieve substantial change in support of sustainability and a just transition.



⁷ <https://www.10kraingardens.scot/>

9 Acknowledgements

This report corresponds with Deliverable 4a “Briefing on governance factors affecting Nature-Based Solutions” due month 34, carried out as part of WP4 of project ‘AiM NbS’. AiM NbS is a research project focused on understanding and enabling catchment-based NbS in Scotland, Project JHI-D2-2 funded by the Scottish Government Strategic Research Programme. WP4 of AiM NbS focuses on socio-economic opportunities and barriers to NbS, exploring the views and possibilities for different stakeholders to get more involved in NbS in Scotland.

This briefing also draws on insights from a Horizon 2020 ‘MERLIN’ project, and the expertise of colleagues working across both AiM NbS and MERLIN.

For more information about the wider AiM NbS project, please visit

<https://www.hutton.ac.uk/research/projects/achieving-multi-purpose-nature-based-solutions>.

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