IUCN Global Standard for Nature-based Solutions

A user-friendly framework for the verification, design and scaling up of NbS

First edition

INTERNATIONAL UNION FOR CONSERVATION OF NATURE

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About IUCN

IUCN is a membership Union uniquely composed of both government and civil society organisations. It provides public, private and non-governmental organisations with the knowledge and tools that enable human progress, economic development and nature conservation to take place together.

Created in 1948, IUCN is now the world's largest and most diverse environmental network, harnessing the knowledge, resources and reach of more than 1,400 Member organisations and some 15,000 experts. It is a leading provider of conservation data, assessments and analysis. Its broad membership enables IUCN to fill the role of incubator and trusted repository of best practices, tools and international standards.

IUCN provides a neutral space in which diverse stakeholders including governments, NGOs, scientists, businesses, local communities, indigenous peoples organisations and others can work together to forge and implement solutions to environmental challenges and achieve sustainable development.

Working with many partners and supporters, IUCN implements a large and diverse portfolio of conservation projects worldwide. Combining the latest science with the traditional knowledge of local communities, these projects work to reverse habitat loss, restore ecosystems and improve people's well-being.

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This *Global Standard for Nature-based Solutions* is accompanied by *the Guidance for using the IUCN Global Standard for Nature-based Solutions* (https://doi.org/10.2305/IUCN.CH.2020.09.en), which provides scientific basis and guidance for users.

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Conforms to	IUCN Environmental and Social Management System (ESMS) ISEAL Standard-Setting Code of Good Practice
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0.1	2018 Oct	Shared internally with IUCN Members, Commissions and Secretariat.
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0.5	2020 March	Revisions made based upon external peer review.

Global Standard for Nature-based Solutions

Introduction

Background

For most of the 20th century, decision-makers treated the conservation of nature as peripheral to national and global agendas. At best, it was considered a worthy interest, at worst an obstacle to development. However, growing scientific consensus indicate that such views were misplaced and that "*nature is essential for human existence and good quality of life*"[6]. Failure to recognise this fact not only results in a model of economic growth that significantly contributes to the loss of biodiversity, it also misses the opportunity to effectively deploy nature in helping resolve major societal challenges such as climate change, food security and disaster risk reduction.

The sustainable deployment of natural capital, that is the world's stocks of natural assets which include geology, soil, air, water and all living things, has an important role in achieving the United Nations' Sustainable Development Goals. For decades, IUCN has carried out innovative conservation initiatives that have simultaneously helped protect, manage and restore the environment while delivering tangible and sustainable benefits for people. This type of approach is now widely known as Nature-based Solutions (Figure 1). It is well documented that Nature-based Solutions (NbS), such as watershed protection, can generate income for local communities as well as benefits for municipalities that depend on these resources for their health and well-being. From investing in the restoration of degraded lands and shorelines to optimising the performance of traditional infrastructure, such as dams and levees, there is now overwhelming evidence that shows nature plays a critical role to in meeting our societal needs.

Figure 1 "Nature-based Solutions are actions to protect, sustainably manage and restore natural and modified ecosystems in ways that address societal challenges effectively and adaptively, to provide both human well-being and biodiversity benefits" (IUCN, 2016)

IUCN believes that mainstreaming nature conservation into key economic sectors is essential. Increasingly, governments and business alike recognise that NbS are not only useful tools, but imperative for addressing the dual global crises on biodiversity loss and climate change.

Research highlights that NbS could provide around 30% of the cost-effective mitigation needed by 2030 to stabilise warming to below 2°C. They can also provide a powerful defence against the impacts and long-term hazards of climate change, which is the biggest threat to biodiversity. Finding ways to work with ecosystems, rather than relying solely on conventional engineered solutions, can help communities adapt to climate change impacts. Using nature to green cities can also result in significant energy savings and health benefits.

Many countries are already taking action to include NbS in their national climate strategies, which is why it is important to ensure that these actions are developed and implemented based on the best criteria and practices available. To help guide this uptake, IUCN coined the first global definition of NbS in 2016. They are "Actions to protect, sustainably use, manage and restore natural or modified ecosystems, which address societal challenges, effectively and adaptively, providing human well-being and biodiversity benefits".

The fundamentals of NbS are derived from established practices such as forest landscape restoration, integrated water resource management, ecosystem-based adaptation and mitigation, and ecosystem-based disaster risk reduction, several of which were first developed and promoted by IUCN in the late 1990s and early 2000s. Since then, governments, business, academia and non-government actors have continued to demonstrate their value.

Today, NbS are considered by a wide range of stakeholders as an essential mechanism for achieving sustainable development. The IUCN Global Standard on Nature-based Solutions aims to ensure the application of this approach is credible, and its uptake tracked and measured for adaptive management so that its contributions can inspire others. Furthering this work will require scientific rigour, academic research, good governance and most of all, a willingness on the part of the various parties to help mainstream the Standard, and by doing so, help it to evolve as a key conservation and development tool, together.

Why do we need the Standard?

As NbS enters into policy and is adopted by projects on the ground there is a pressing need for greater clarity and precision of what the concept entails and what is required for it to be deployed successfully. Without this, the application of NbS could result in inconsistent and ungrounded applications. The Standard, therefore, also provides a systematic learning framework so that lessons can improve and evolve the applications, leading to greater confidence in NbS among decision makers. Similarly, in the absence of such a Standard, NbS may remain a general concept, only marginally contributing to the pressing sustainability needs and not realising its full potential. Consequently, the Standard provides an opportunity to create a global user community that helps guide implementation on the ground, accelerate policy development, and create conservation science on NbS. Through the Standard, NbS will be based on a common understanding of its interpretation and a shared vision for a just and sustainable world.

What does the Standard do?

This Standard aims to equip users with a robust framework for designing and verifying NbS that yield the outcomes desired, in solving one or several societal challenge(s). Based on the feedback of actual and potential NbS users, it has been developed as a facilitative Standard, purposefully avoiding a rigid normative framing with fixed, definitive thresholds of what NbS ought to achieve. Rather the Standard is designed to support users to apply, learn and continuously strengthen and improve the effectiveness, sustainability and adaptability of their NbS interventions.

It also serves as a mechanism for developing a consistent approach to designing and verifying concrete solutions-orientated outcomes. By using this Standard and deploying your NbS in a systematic way, the design and execution quality is accounted for and

the results can be tracked and linked to global goals as well as research narratives. For individual interventions on the ground, applying the Standard gives tangible added value. Firstly, the result can give credibility to the intervention when speaking to investors, donors and other stakeholders. Secondly, the use of the Standard provides individual interventions with recommendations for improvement, using the results as a way to identify gaps and solutions. Thirdly, the Standard can be used as a means of engagement and communication across sectors, starting new conversations and providing a common framework and language to discuss trade-offs.

Who can use the Standard?

IUCN envisions that national governments, city and local governments, planners, businesses, donors, financial institutions including development banks and non-profit organisations will all be primary users of the Standard. The Standard can be used by stakeholders working in a range of settings from protected areas to productive landscapes to urban areas, and across different regions and in modified or intact ecosystems. Users can apply the Standard to both large-scale and small-scale interventions.

What does the Standard look like?

The Standard consists of 8 Criteria and 28 Indicators (Figure 2). Criterion 1 focuses on identifying the societal challenge to which the NbS is a response.

While the scope of societal challenges currently includes climate change (adaptation and mitigation), disaster risk reduction, ecosystem degradation and biodiversity loss, food security, human health, social and economic development and water security, as NbS evolve in their scope, there may be other specific challenges recognised within this scope. One or more societal challenges can be the entry point; however, the priority is to leverage the potential NbS to provide multiple benefits, whereby one intervention addresses several challenges.

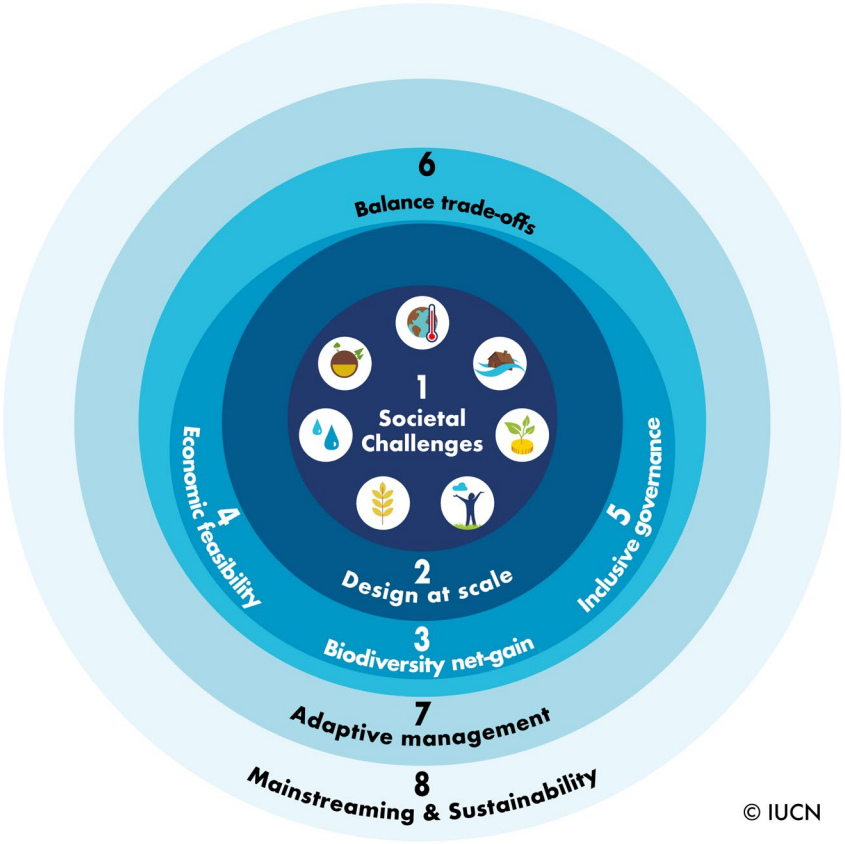

Figure 2 The eight Criteria that make up the IUCN Global Standard for NbS are all interconnected.

Criterion 2 guides the design of the solution responding to the scale of the issue. Scale in this context primarily refers to geographic scale across land and sea, as well as the economic, ecological and societal aspects of the land/seascape. The target area where the societal challenge is being addressed is often a part of a bigger system, be it ecological, economic or social. While intervention activities can be focused at the site scale, the robustness, applicability and responsiveness of the solution should take into consideration the broader systems at play.

Criteria 3, 4 and 5 correspond to the three pillars of sustainable development – environmentally sustainable, socially equitable and economically viable. For each Criterion, some understanding of the current resources and context, in the form of a baseline, and sustainable actions going forward is required for implementation of a strong NbS.

Criterion 6 addresses the balancing of trade-offs and choices that need to be made to achieve short and long-term gains, and how to ensure that there is a transparent, equitable and inclusive process to determine such trade-offs. Given the dynamic nature of the systems that influence the solutions (Criterion 2), it is important to manage the implementation of NbS systematically against established baselines. NbS harness the services of ecosystems, which are complex, dynamic and self-organising systems. Ecosystems may respond in desirable ways to an NbS intervention or the intervention could create unintended, unforeseen and undesirable consequences. Consequently, Criterion 7 responds to the need for adaptive management, which facilitates continuous learning about system-wide processes and adapting the NbS according to systemic changes.

The true potential of NbS is realised through its long-term implementation at scale. Embedding the concept and actions into policy or regulatory frameworks as well as linking to national targets or international commitments can enable this, as promoted by Criterion 8.

How can this Standard be used?

The Standard is intended to be a simple yet robust hands-on tool that enables the translation of the NbS concept into targeted actions for implementation, reinforcing best practice, addressing and correcting shortfalls and enabling interventions to align with internationally accepted NbS principles (WCC-2016-Res-069). The Standard can be implemented using existing project management tools and technical approaches. Additionally, the alignment of the Indicators with existing reporting and operational management systems minimises additional work needed to implement a credible NbS intervention (Figure 3). Furthermore, as a self-assessment tool, the user-friendly Global Standard for NbS (Part I) is accompanied with an in-depth guidance which includes the scientific background for NbS and provides expanded guidance on the Criteria and Indicators. Part III complements the Standard offering a user manual, presenting suggested means of verification and a compendium of tools and approaches that can be used to apply the Standard.

For the initial rollout phase of the NbS Standard, a self-assessment tool has been developed to enable Standard users to calculate the percentage match of their intervention against the eight Criteria and identify whether their intervention adheres to the IUCN Global Standard for NbS. The tool allows users to enter, for each Indicator, how well it has been met (strong, adequate, weak or insufficient), as well as rationales, means of verification and comment. The tool then provides a breakdown for each Indicator and an overall rating of how well the intervention adheres to the Standard using traffic light indicators where an intervention scoring an "insufficient" rating on any Criterion does not adhere to the IUCN Global Standard for NbS.

Assuring a robust Global Standard for NbS

Proposed as a first-party verification, the user applies the Standard to assess the project/intervention against the set Criteria and Indicators. A self-verification approach to the Standard aligns with IUCN's intent to provide a *facilitative* Standard that supports users from a wide spectrum of society to successfully transition towards well-designed, executable and durable NbS. Nevertheless, the facilitative intent does not negate the need for credibility and robustness while implementing the Standard. An authoritative and recognised governance structure as well as a robust application process with learning feedback loops to improve the Standard are therefore needed as next steps in rolling out the Standard. The overall governance structure will be made up of four main components:

- *An International Standard Committee* as the overarching authority that is composed of the leadership and representatives of the other three components;
- *A Scientific Committee* that is primarily responsible for scientific rigour in applying the Standard and the scientific robustness of the knowledge;

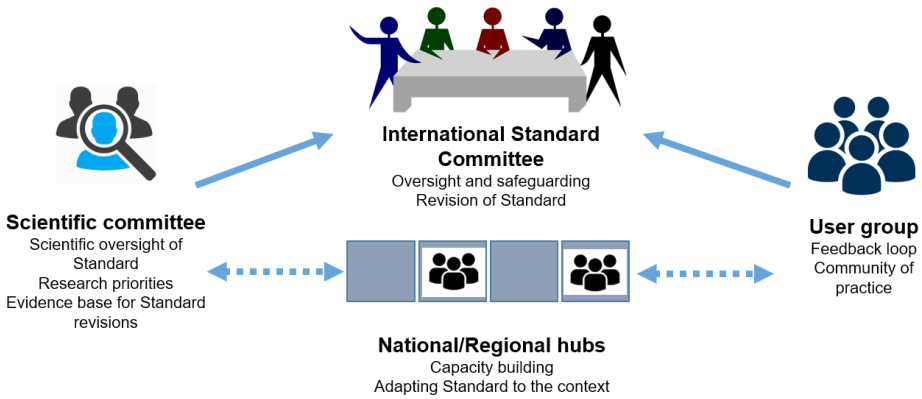

Figure 3 Governance of the Standard through an International Standard Committee © IUCN

- *A User group* that can drive the learning and feedback for evolving the Standard through lessons learnt from applications;
- *Operationalising hubs (regional or national)* that can support the adaptation of the Standard to the context and the consequent development of solutions relevant for society, the economy and the environment that are durable and beneficial in the long term.

This will ensure that there is global stewardship in driving a scientifically robust and globally relevant application of the Standard in achieving the NbS ambition. Through such a stewardship mechanism, the interpretation of the NbS concept and application of the Standard to the context at hand (such as national) can be achieved, while maintaining consistency, quality and assurance. Furthermore, a wide-ranging User group can stay engaged in the longer term as the group will be instrumental in learning feedback loops and improvement of the Standard.

Criterion 1: NbS effectively address societal challenges

Guidance:	**Indicators**
The purpose of this Criterion is to ensure that the NbS is designed as a response to a societal challenge(s) that has been identified as a priority by those who are or will be directly affected by the challenge(s). All stakeholders, especially rights holders and beneficiaries of the NbS, must be involved in the decision-making process used for identifying the priority challenge(s) (Criterion 5).	**1.1 The most pressing societal challenge(s) for rights-holders and beneficiaries are prioritised** Guidance: The NbS intervention must address clearly specified challenges that have significant and demonstrable impacts on society. Identification of the most pressing societal challenges is best informed by a transparent and inclusive consultation process (Criterion 5), as opinions may differ between external stakeholders and local populations and vice versa.
	1.2 The societal challenge(s) addressed are clearly understood and documented Guidance: Establishing a clear understanding and rationale of the challenges to be addressed, and ensuring these are documented, is important for future accountability and optimising those strategies to contribute to human well-being outcomes (1.3). An NbS often yields multiple societal benefits, such as job creation or increased flow of ecosystem services, and the societal challenges these additional benefits address should also be documented.
	1.3 Human well-being outcomes arising from the NbS are identified, benchmarked and periodically assessed Guidance: NbS must deliver tangible and substantive benefits to human well-being. Specific, measurable, attainable, realistic and timely (SMART) targets should be used as appropriate, as they are important for accountability and informing adaptive management (Criterion 7).

Societal challenges:

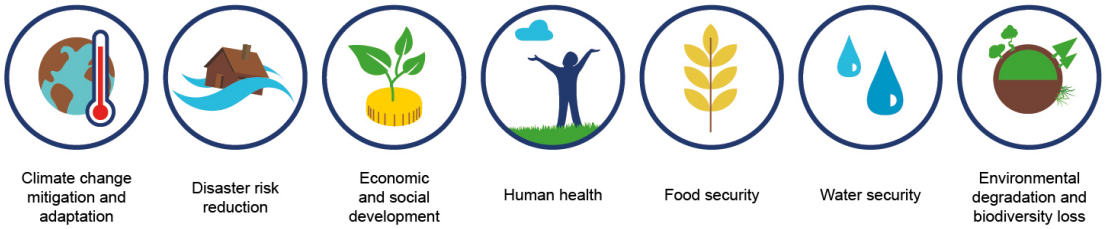

Figure 4 Major societal challenges addressed by NbS. The first six challenges, from left to right, were formulated within the IUCN definition (IUCN, 2016). The seventh societal challenge, reversing ecosystem degradation and biodiversity loss, was an outcome of the second public consultation on the Standard © IUCN

Figure 5 Saplings growing in a field where Assisted Natural Regeneration, a simple low-cost land restoration method, is in place. By retaining and encouraging the natural regeneration of seedlings, soil productivity is enhanced and the seedlings can eventually provide shade and protection to crops, thus contributing to resilience to extreme events. © IUCN/El Hadji Ballé

Case study: Identifying a societal challenge[1]

Senegal faces tangible risks from climate change and disasters. Climate change impacts are characterised mostly by erratic rainfall events driving soil salinisation and degradation and contributing to the risks to agricultural productivity and economic development posed by drought and desertification. Using the *Promoting Local Innovations* method, the community members defined their societal challenges as disaster risks, food security and ecosystem degradation. While, initially, the project design had a strong focus on climate change adaptation and disaster risk reduction, following the community planning process, project managers redesigned activities to include all the challenges identified. Sustainable agricultural practices and strengthening the local resilience of people and nature to floods and the impacts of land salinisation were the resulting NbS solutions, co-designed with the communities and collaboratively implemented by all stakeholders involved in the consultation process. Making the project priorities more inclusive of local needs was relatively simple and yielded co-benefits like soil rehabilitation, biodiversity gains and higher food crop yields.

1 Monty, F., Murti, R., Miththapala, S. and Buyck, C. (eds). (2017). *Ecosystems protecting infrastructure and communities: lessons learned and guidelines for implementation*. Gland, Switzerland: IUCN. https://doi.org/10.2305/IUCN.CH..2017.14.en

Criterion 2: Design of NbS is informed by scale

Guidance:	**Indicators**
The purpose of this Criterion is to encourage NbS designs that recognise the complexity and uncertainty that occur in living dynamic land/seascapes. Scale applies not only to the biophysical or geographic perspective but also to the influence of economic systems, policy frameworks and the importance of cultural perspectives. NbS design will be informed by what stakeholders know about the interactions between different aspects of a land/seascape using a three-scale framework that considers the parts within the land/seascape; the land/seascape itself; and the wider environment around the land/seascape. One example would be households within villages within a local authority area. Understanding the interactions which affect attributes like cultural values, laws, soils, forests and water are important in this regard, as they are relevant to the assessment of the risk of undesirable change, or the probability of creating desirable change. NbS design seeks to maintain the productive capacity of ecosystems as well as the production of benefits necessary for human well-being.	**2.1 The design of the NbS recognises and responds to interactions between the economy, society and ecosystems** Guidance: The success of an NbS will be determined not only by the quality of the technical intervention but, critically, how well the interactions between people, the economy and the ecosystem are understood and responded to. For the solutions to be durable and sustainable, the design of NbS requires a "systems" framing that acknowledges and addresses these types of interactions and builds them into the decision-making process. **2.2 The design of the NbS is integrated with other complementary interventions and seeks synergies across sectors** Guidance: NbS will seek to work with and compliment other types of interventions, such as engineering projects, information technology, financial instruments, etc. Such complementary actions will inherently require the identification of synergies across different sectors according to the specifics and context of each situation. **2.3 The design of the NbS incorporates risk identification and risk management beyond the intervention site** Guidance: NbS has the potential to either positively or negatively impact, or be impacted by, stakeholders, interests and ecosystems outside the immediate intervention area. For the solution to be durable and sustainable, such types of interactions both within and around the intervention area need to be understood and accounted for in the decision-making processes. Appropriate risk management options should be incorporated into the intervention design.

Design with scale in mind

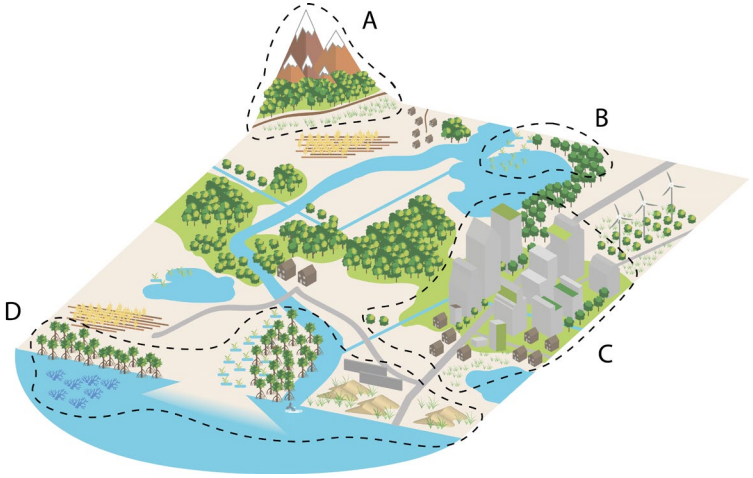

Figure 6 Illustrating consideration of factors beyond the immediate site and intervention in order to take into account opportunities, risks and relevant factors at scale when designing NbS. For NbS D, upstream NbS B-C need to be taken into account including other types of interventions such agriculture or road infrastructure. When considering scale, different NbS can be designed and combined, as a holistic approach to addressing the societal challenge/s. © IUCN

Figure 7 Colleagues at the Kenyan Water Resource Management Authority (WRMA) installing river gauge board holders in Tana river © CIAT/Georgina Smith

Case study: Design with scale in mind – Blending NbS with built water infrastructure for solutions at scale

Through applied research under the WISE-UP to Climate project, the results demonstrated that natural infrastructure is a vital national asset that supports livelihoods, sustains economic development and helps climate change adaptation in the Tana basin (95,000 km^2), Kenya. A simulation model for the Tana basin system was developed to investigate the impacts of changing the operation of existing built infrastructure, of adding new infrastructure (e.g. the Northern Water Collector Tunnel, the High Grand Falls Dam, large new irrigation schemes near the Tana Delta) or of investing more in natural infrastructure. To achieve this, natural infrastructure benefits were recognised and valued, including: the seasonal fish catch across the floodplain, flood recession agriculture, reservoir fisheries, estuary fisheries, floodplain cattle grazing, and sediment transport through the delta to the coast. On average, they accrue to more than US$ 170 million per year, mainly to subsistence smallholder farmers and pastoralists in the lower Tana basin. The removal or degradation of these benefits risk further heightening tensions over land and water resources in the lower basin. Natural infrastructure in the Tana basin also benefits the provision of water and biodiversity related services derived from current built water infrastructure worth on average US$ 139 million a year. The cascade of dams in the Tana basin provides significant economic benefits: in terms of electricity sales of at least US$ 128 million a year and from irrigation, US$ 9 million a year. The basin provides 65% of the national electricity needs through hydropower, and nearly all of Nairobi's domestic water supply for 4 million people. WISE-UP results show that scaling-up current investments in natural infrastructure in the upper catchment, such as those being undertaken by the Nairobi Water Fund, would likely further improve dam performance and safeguard benefits even in the face of future climate change.[2]

2 http://www.waterandnature.org/sites/default/files/wise_up_nibi_final_infographic.pdf

Criterion 3: NbS result in a net gain to biodiversity and ecosystem integrity

Guidance:	**Indicators**
NbS are derived as goods and services from ecosystems, therefore strongly depend on the health of an ecosystem. Biodiversity loss and ecosystem change can have significant impacts on the functioning and integrity of the system. Therefore, NbS design and implementation must avoid undermining the integrity of the system and instead, proactively seek to enhance the functionality and connectivity of the ecosystem. Doing so can also ensure the long-term resilience and durability of the NbS.	**3.1 The NbS actions directly respond to evidence-based assessment of the current state of the ecosystem and prevailing drivers of degradation and loss** Guidance: To develop a solution using nature, one must have a well-founded understanding of the current state of the ecosystems concerned. The baseline assessment needs to be broad enough to characterise ecological state, drivers for ecosystem loss and options for net improvements, making use of both local knowledge and scientific understanding where possible.
	3.2 Clear and measurable biodiversity conservation outcomes are identified, benchmarked and periodically assessed Guidance: In order to inform the design, monitoring and assessment of an NbS, targets for enhancing key biodiversity values should be established. For each NbS, the type of target may differ; for example, the target could be the percentage of ecosystem area restored or the return of a keystone species.
	3.3 Monitoring includes periodic assessments of unintended adverse consequences on nature arising from the NbS Guidance: Ecosystems are complex with interdependent components and processes. There will always be a level of uncertainty in how they will react to specific interventions or other external changes. Therefore, NbS should be designed and monitored to minimise and mitigate unanticipated risks that might undermine the ecological foundations of the solution itself.
	3.4 Opportunities to enhance ecosystem integrity and connectivity are identified and incorporated into the NbS strategy Guidance: Utilising NbS can provide an opportunity to enhance biodiversity conservation and ecosystem management efforts in ways that other types of intervention, in isolation (such as engineering), will not be able to achieve. If solutions are to be implemented close to natural ecosystems that are managed explicitly for conservation outcomes, the NbS should be designed to enable greater ecosystem connectivity. Furthermore, they could be designed to re-introduce lost components of an existing ecosystem, for example, by deliberately choosing formerly existing species of vegetation when restoring.

Biodiversity net-gain

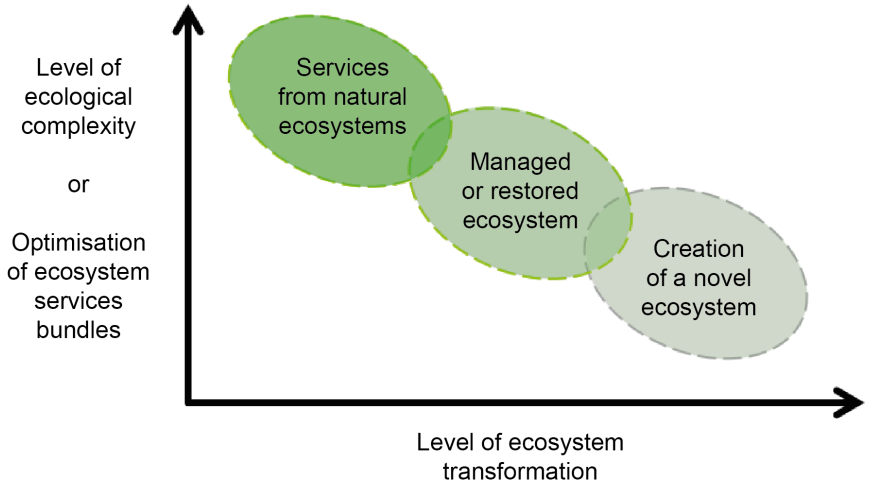

Figure 8 The relationship between ecological complexity and ecosystem services optimisation, and the level of engineering ecosystems. (Adapted from Balian, Eggermont & Le Roux (2014))

Figure 9 An aerial view of the Medmerry project. Local stakeholders, with the Environmental Agency, went to view a 110 m wide breach of the existing shingle bank, allowing tidal water to flow in to create 183 ha of new intertidal habitat area. © Environmental Agency. Contains public sector information licensed under the Open Government Licence v3.0..

Case study: Demonstrating biodiversity gains: Large-scale coastal re-alignment using NbS can (re)create biodiversity habitats

After 50 years of learning from traditional responses such as levees and seawalls, the United Kingdom is changing its approach in how it deals with coastal flooding and storms. The Medmerry project is one such large-scale managed realignment of coastal protection infrastructure, which combines the use of natural coastal vegetation as physical protection with the realignment of engineered infrastructure to retreat and move the coastline inland. This lets the waters further inland yet reduces the risks of flooding of neighbouring towns, while the surrendered land is increasingly becoming a biodiversity habitat for many species.[3] The initiative has involved systematic and repeated scientific studies to generate the lessons learnt from the failure of engineered infrastructure and the costs associated with losses from the impact of natural hazards, as well as the knowledge and experience of local stakeholders including 360 residents or property owners, many of them coastal farmers. The realignment initiative is co-managed by the government and local stakeholders with a strong commitment to inform ongoing implementation from other such experiments and experiences.[4]

3 Thomas, A. *Medmerry Coastal Realignment: Success for People and Wildlife*. (RSPB, unpublished).

4 Pethick, J. (2002). Estuarine and tidal wetland restoration in the United Kingdom: policy versus practice. *Restoration Ecology* 10: 431–437. https://doi.org/10.1046/j.1526-100X.2002.01033.x

Criterion 4: NbS are economically viable

Guidance:

The return on investment, the efficiency and effectiveness of the intervention, and equity in the distribution of benefits and costs are key determinants of success for an NbS. This Criterion requires that sufficient consideration is given to the economic viability of the intervention, both at the design stage and through monitoring the implementation.

For NbS to be sustainable, there must be strong consideration of the economic aspects as, most likely, long-term gains must be balanced against short-term costs, with short-term actions developed within the context of long-term (over generations) goals and plans.

If the economic feasibility is not adequately addressed, NbS run the risk of being short-term projects, where, after closing, the solution and benefits provided cease to exist, potentially leaving the landscape and communities worse off than before.

Innovative and evidence-based tools for the valuation of nature, along with ideas for NbS contributions to markets and jobs, encourage creative (blended) financing of NbS, thereby increasing the likelihood of their long-term success.

Indicators

4.1 The direct and indirect benefits and costs associated with the NbS, who pays and who benefits, are identified and documented
Guidance: Identification and documentation of the main benefits derived, including their direct and indirect, financial and non-financial elements are key components for assessing the economic feasibility of the intervention, over time. This information should be differentiated according to who receives the benefits and who bears the costs.

4.2 A cost-effectiveness study is provided to support the choice of NbS including the likely impact of any relevant regulations and subsidies
Guidance: Investing heavily in upfront costs without considering the longer-term economic and financial sustainability can negatively impact the intervention's viability. A cost-effectiveness study not only enables an examination of the upfront and recurring costs against the anticipated longer-term benefits of the proposed intervention(s) over time but also allows key (or hidden) assumptions to be made explicit, tested and verified.

4.3 The effectiveness of the NbS design is justified against available alternative solutions, taking into account any associated externalities
Guidance: A key attribute of an NbS is that it is capable of addressing at least one societal challenge in a manner that is both economically viable and efficient. This means that the cost-effectiveness and affordability of the solution must be tested against viable alternatives. Alternative solutions may include a different nature-based solution (for example watershed catchment management rather than floodplain management), a different combination of conventional and nature-based solutions, or substitution of the nature-based solution entirely with a more conventional approach such as engineered infrastructure.

4.4 NbS design considers a portfolio of resourcing options such as market-based, public sector, voluntary commitments and actions to support regulatory compliance
Guidance: The fact that NbS simultaneously offers multiple benefits to different stakeholders may place limits on some sources of financing, thereby undermining the interventions long-term viability. For example, private investors may not wish to bear the cost of delivering public goods or public authorities may be reluctant to cover costs for benefits that will accrue privately. This may require a resourcing package that integrates a range of financial mechanisms. Sources of investment can include public-sector grants, incentives and low interest loans, private-sector loans and equity, blended public-private partnerships as well as philanthropic and voluntary contributions or combinations of the above, reflecting an equitable distribution of both the risks and returns.

Economic viability

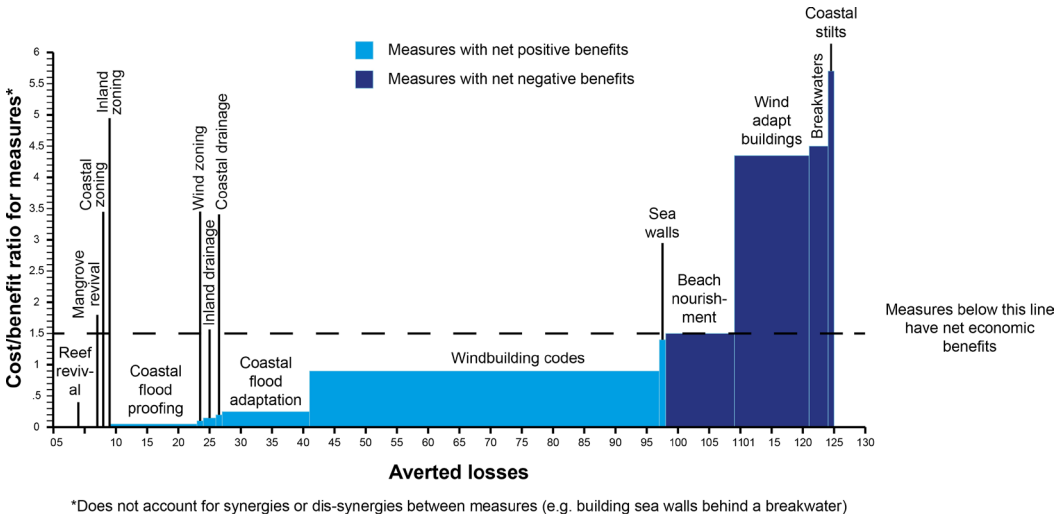

Figure 10 Cost-benefit analysis of coastal protection from natural hazards and climate change through investing in coastal ecosystems and other measures, Barbados (Adapted from Mueller and Bresch, 2014, source: ECA Working Group, CCRIF)

Figure 11 Folkestone National Park, Barbados © Gary J. Wood/Flickr

Case study: Coastal ecosystem management as NbS for the climate crisis[5]

The potential economic loss in Barbados from climate risks may rise to US$ 279 million per annum by 2030, taking into account an estimated additional US$ 84 million in potential average yearly loss generated by the increase in asset accumulation as a result of economic development during that period. Additionally, a high climate change scenario featuring rising sea levels, more severe hurricanes and land subsidence adds another US$ 56 million for a total amount of US$ 279 million expected annual losses by 2030. Overall, expected loss as a proportion of GDP could rise to between 2% and 9% in the high climate change scenario by 2030. Barbados could cost-effectively avoid more than a third of expected losses by implementing risk mitigation initiatives such as beach nourishment and reef and mangrove revivals. Protecting the Folkestone Marine Park on the west coast of Barbados and ensuring reef and mangrove revivals can lower losses by US$ 20 million annually for an annual cost of only US$ 1 million. Additional benefits are natural restoration and habitat rebuilding, together with ecotourism attractions. In addition, mangrove forests trap sediment therefore reducing erosion and may withstand waves of 5 to 7 m or higher. However, mangrove revival in Folkestone Marine Park not only requires financial resources, but also a cultural shift – mangroves are currently viewed as a nuisance because they are mosquito breeding grounds, have an unpleasant smell, and block access to the sea. Early efforts to cultivate mangroves may be wiped out in storms until the mangroves have become established. Finally, the full effectiveness of mangroves for damage reduction requires mature mangrove forest.

5 Mueller, L. and Bresch, D. (2014). 'Economics of climate adaptation in Barbados – Facts for decision making'. In: R. Murti and C. Buyk (eds.), *Safe Havens: Protected Areas for Disaster Risk Reduction and Climate Change Adaptation*, pp.15-21. Gland, Switzerland: IUCN. https://portals.iucn.org/library/node/44887

Criterion 5: NbS are based on inclusive, transparent and empowering governance processes

Guidance:

This criterion requires that NbS acknowledge, involve and respond to the concerns of a variety of stakeholders, especially rights holders.

Good governance arrangements are proven to not only reduce an intervention's sustainability risks, but also to enhance its social 'license to operate'. Conversely inadequate governance provision for otherwise well-intended actions can adversely affect the legitimacy of benefit and cost sharing arrangements.

At a minimum, NbS must adhere to and align with the prevailing legal and regulatory provisions, being clear on where legal responsibilities and liabilities lie. However, as often is the case with natural resources, basic compliance will need to be complemented with ancillary mechanisms that actively engage and empower local communities and other affected stakeholders.

Indicators

5.1 A defined and fully agreed upon feedback and grievance resolution mechanism is available to all stakeholders before an NbS intervention is initiated
Guidance: Feedback and grievance resolution mechanisms can include formal, legal or informal non-legal complaint systems that operate according to a clear set of procedures, roles and rules for receiving complaints and providing a remedy. Effective grievance resolution mechanisms are characterised by their acceptance and legitimacy among affected stakeholders, transparency, accessibility and adherence to rights-based approaches. They should operate in a predictable and equitable manner, and be based on engagement and dialogue.

5.2 Participation is based on mutual respect and equality, regardless of gender, age or social status, and upholds the right of Indigenous Peoples to Free, Prior and Informed Consent (FPIC)
Guidance: In order that governance arrangements function effectively, all affected stakeholders need to be equipped with the right information at the right time and the inputs they provide need to be meaningfully addressed. In doing so, a conscious effort is required to ensure that traditionally excluded groups are actively brought into the process in a manner that upholds their dignity and encourages their participation. This is particularly the case when an NbS intervention operates or impacts on the lands and territories of indigenous peoples, where their right to self-determine interventions and outcomes should follow established FPIC protocols.

5.3 Stakeholders who are directly and indirectly affected by the NbS have been identified and involved in all processes of the NbS intervention
Guidance: Stakeholder mapping and analysis identifies those who may be directly and indirectly, positively or negatively, affected by the NbS. This allows the intervention to afford opportunities to affected stakeholders to engage with and participate in the design and implementation, advocate clearly to uphold their own rights and interests, and where necessary, prevent further marginalisation.

5.4 Decision-making processes document and respond to the rights and interests of all participating and affected stakeholders
Guidance: It is important that transparent and accessible documentation records key steps in NbS decision-making procedures. This helps enhance accountability and provides a strong basis for recourse in the case of any disputes or disagreements. Specific attention should be paid to noting which stakeholders where involved in decision-making and the role they played. This is particularly important where extreme inequity persists so that processes can be adapted to encourage meaningful and effective participation.

5.5 Where the scale of the NbS extends beyond jurisdictional boundaries, mechanisms are established to enable joint decision-making of the stakeholders in the affected jurisdictions
Guidance: Ecosystems do not follow political and administrative borders. Where appropriate, transboundary cooperation agreements between relevant authorities underpin NbS planning and implementation across frontiers to help ensure coherency and consistency of approach and desired outcomes.

Inclusive governance

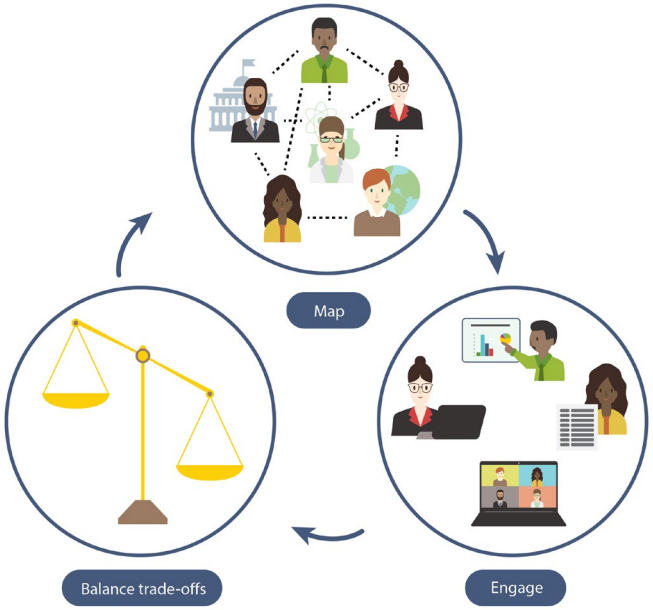

Figure 12 The immediate and long-term success of NbS depends on inclusive, transparent processes of engagement, management and leadership.© IUCN

Figure 13 Co-creation of the experiment for a linear park in Antwerp in a "dreaming" exercise.© Stadslab 20150, Antwerp, 17.09.2017

Case study: Collaborative planning and implementation of urban NbS in Sint Andries

Urban planners need to be open to collaborative governance mechanisms when planning and implementing NbS in cities. This not only involves processes that include different actors in the design and execution, but also considerations of establishing new institutions for operationalising and enabling NbS in the long term. In Antwerp, a 'dreaming' exercise in 2017 for a green corridor to connect different NbS for water security, involved authorities and citizens of the district of Sint Andries. This was used to co-create and initiate an experiment on identifying spaces for introducing different NbS solutions for water retention, such as bioswales, vegetated ditches with porous bottoms.

People with different backgrounds, qualifications and knowledge systems were included and their visual and verbal inputs were collected in the process. This shared narrative and vision of NbS has triggered changes in the way citizens perceived local institutions and led to strong NbS ownership amongst actors. Through the analysis of cases such as Sint Andries, collaborative governance versus investor driven governance has been identified as one of seven critical factors in the successful implementation of NbS in cities.

Criterion 6: NbS equitably balance trade-offs between achievement of their primary goal(s) and the continued provision of multiple benefits

Guidance:

Trade-offs in land and natural resource management is inevitable. Ecosystems provide a wealth of different benefits and not everyone values each of them in the same way. While trade-offs cannot be avoided, they can be effectively and equitably managed. This Criterion requires that NbS proponents acknowledge these trade-offs and follow a fair, transparent and inclusive process to balance and manage them over both time and geographic space.

This involves a credible assessment, full disclosure and agreement among the most affected stakeholders on how the trade-offs should be addressed. Fair and transparent negotiation of trade-offs and compensation among potentially affected parties for any damages or trade-offs to local opportunities and livelihoods provides the basis for successful long-term NbS outcomes.

Critically, it is important to recognise that trade-offs have social and ecological limits beyond which point certain values or benefits can be lost in perpetuity. This means that safeguards will be necessary to ensure, *inter alia*, that the integrity of ecosystems and the long-term stabilising properties of ecosystem services are not exceeded.

Indicators

6.1 The potential costs and benefits of associated trade-offs of the NbS intervention are explicitly acknowledged and inform safeguards and any appropriate corrective actions
Guidance: All trades-off are accompanied with an associated set of costs and benefits which may be subject to change over the entire NbS lifecycle. A key function of NbS safeguards is to ensure that necessary trade-offs do not negatively impact the most disadvantaged elements of society or, equally, that they are denied access to the intervention's benefits. It is therefore important that the costs and benefits of trade-off arrangements are fully understood, widely shared among affected stakeholders, and periodically revisited (6.3)

6.2 The rights, usage of and access to land and resources, along with the responsibilities of different stakeholders, are acknowledged and respected
Guidance: The legal and customary rights to access, use and control management over land and natural resources, particularly of vulnerable and marginalised groups, needs to be respected and upheld. Rights, use and responsibilities of stakeholder groups in relation to the NbS should be analysed and assessed, using appropriate tools and by building upon the outcomes of stakeholder analysis or mapping (5.3). This is particularly important when dealing with Indigenous communities, where Free, Prior and Informed Consent (FPIC) must be used (5.2).

6.3 The established safeguards are periodically reviewed to ensure that mutually-agreed trade-off limits are respected and do not destabilise the entire NbS
Guidance: Where risk is unavoidable, safeguards must be in place and periodically reviewed to anticipate and avoid adverse consequences of interventions, especially considering that inequity in trade-offs may change over time and that not all stakeholders may be equally affected. Therefore, NbS design and strategy needs to be explicit about whose benefits and whose costs will be addressed, including when and how this will be reviewed. Safeguards may be put in place for biodiversity (e.g. setting aside a certain area for protection or limiting the timing of fishing) and for people (e.g. procedural – grievance mechanisms, consultation obligations, right to appeal or substantive – contracts, legal and regulatory provisions).

Balance trade-offs

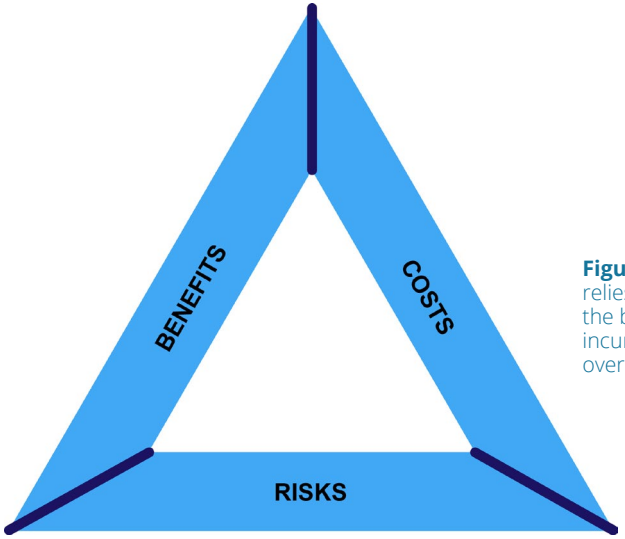

Figure 14 Balancing trade-offs relies upon understanding the benefits, costs and risks incurred by an intervention over time. © IUCN

Figure 15 Hilsa Conservation Group Meeting in Barisal Bangladesh in 2015. © WorldFish, Flickr

Case study: Finding gaps to learn from – food security and fish conservation in Bangladesh

In Bangladesh, where the livelihoods of 11% of the population depend on fisheries, the hilsa fish is one of the country's main staple foods, contributing 1% to the country's GDP in 2016. Hilsa populations declined dramatically in the 1990s, threatening the livelihoods of three million fishers. The main drivers of this species decline were identified to be overfishing and habitat degradation. In order to address the main societal challenges of food security and socio-economic development, the Hilsa Fisheries Management Action Plan was put in place in 2003, which included establishing sanctuary sites for nurseries and spawning, implementing a temporary annual fishing ban to allow population recovery, and enforcing the Protection and Conservation of Fish Act. Simultaneously, after assessing trade-offs and to address the costs associated with the ban, a payment for ecosystem services scheme was set up, providing affected fisher communities with rice in return for not fishing in affected areas. Over time, as fish populations grew, this increased the availability of food and income from catch, providing additional co-benefits such as better human health by providing more cash to buy medicine and increased resilience to climate change. There were, however, unexpected negative consequences and knowledge gaps: fisheries were not recovering as quickly as anticipated, lack of protein in the diets of those most affected and fishers being forced to seek loans during the fishing bans. Trade-offs varied greatly across affected stakeholders. The benefits and costs were dependent on such aspects as where in the supply chain of fisheries one was, whether fishers were upstream or downstream of intense fishing areas, and how close one was to sanctuary sites. Short-term costs, such as the drop in fish prices when fish flooded the market, were felt to outweigh long-term benefits. A re-assessment of trade-offs supplied the knowledge needed to alter compensation and increase support and access to microfinance. As a result, the fishers were incentivised to cooperate to protect the hilsa voluntarily.[6]

6 Reid, H. and Ali, L. (2019). *Ecosystem-based approaches to adaptation: strengthening the evidence and informing policy: Research results from the Incentive-based Hilsa Conservation Programme, Bangladesh*. London, UK: IIED. http://pubs.iied.org/17625IIED

Criterion 7: NbS are managed adaptively, based on evidence

Guidance:

This Criterion requires that NbS implementation plans include provisions to enable adaptive management as a response to uncertainty and as an option to effectively harness ecosystem resilience. A degree of uncertainty is inherent when managing most ecosystems due to their complex, dynamic and self-organising nature. This also means that ecosystems have greater resilience which confers a wider range of options to respond to unanticipated social, economic or climate events.

The foundation of adaptive management is the evidence-base provided by regular monitoring and evaluation, drawing on scientific understanding as well as indigenous, traditional and local knowledge. By proactively adopting an adaptive management approach, the NbS can continue to be relevant through the lifecycle of the intervention and the risk of redundancy and stranded investments minimised.

Indicators

7.1 A NbS strategy is established and used as a basis for regular monitoring and evaluation of the intervention
Guidance: An NbS strategy, at its most basic, includes the reasoning behind the NbS, a precise articulation of the intended outcomes and clear understanding of how these should be achieved through the actions taken. It should be informed by the prevailing economic, social and ecological conditions, and clearly state the assumptions as to whether and how they are expected to change.

7.2 A monitoring and evaluation plan is developed and implemented throughout the intervention lifecycle
Guidance: A monitoring and evaluation plan is a key requirement to understand whether the NbS strategy effectively delivers the intended outcomes ~~and~~, thereby addressing the societal challenge; and, whether risks or unexpected impacts mean a change in strategy or action is required. Where NbS have synergies with other interventions or approaches, these should be included in the monitoring and evaluation (M&E) plan. Observed and sustained deviations from the key elements of the NBS strategy (7.1) should trigger an adaptive management response (7.3).

7.3 A framework for iterative learning that enables adaptive management is applied throughout the intervention lifecycle
Guidance: Learning based on evidence should drive NbS management. Furthermore, iterative -learning is essential in informing adaptive management actions, in order to respond to the factors influencing NbS interventions. For this Criterion, indicators 7.1 and 7.2 provide a continuous feedback loop to learn and adapt the NbS intervention. Ideally, iterative learning is institutionalised so that it carries on even after the NbS intervention ceases.

Adaptive management

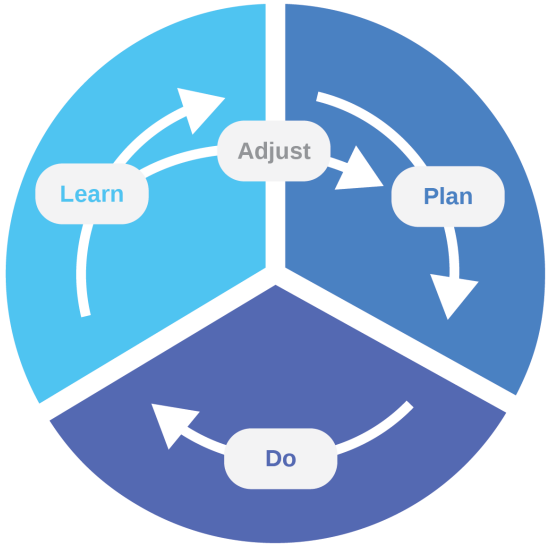

Figure 16 Evidence based adaptive management can greatly enhance the chances of successful implementation and long term durability of the solution. Planning and learning by doing form a strong basis for taking an adaptive management approach © IUCN

Figure 17 Oxen ploughing the degraded lands for restoration and cropping, Shinyanga © Edmund Barrow

Case study: Shinyanga

Shinyanga, in northwest Tanzania and south of Lake Victoria, supports over 2.25 million people in an area of just 50,000 km^2. High population densities have exacerbated serious problems of land clearing and degradation. A national restoration initiative (HASHI) started in 1985 involving the planting of exotic trees. Over 1 million exotic seedlings from one centralised tree nursery were distributed to about 700 villages. However, this met with little success, in some part due to the villagers' lack of ownership of the project. Through adaptive management, a more participatory approach was taken, a choice pivotal to long-term success. Local villagers did not want "HASHI trees" but their (mostly indigenous) trees. Top down approaches failed as HASHI did not involve local people and their institutions. Building the local capacities of villagers and working with the people and their traditional institutions to re-design restoration efforts became new priorities. The ingredients for successful forest restoration came together by respecting formal and informal local institutions. By 2004, over 300,000 ha were restored, valued at US$14 per person per month. Nearly every family had restored areas. Landless people and female-headed households were allocated land, and groups and villages had larger restored areas. HASHI adopted pioneering participatory approaches to replace the top-down processes. From one centrally managed government tree nursery in 1986 and a region referred to as the 'desert' of Tanzania, over 1,000 small community and individual tree nurseries had been established by 2004 with over 300,000 ha of restored woodland. Additionally, HASHI was a process that began as a project, became a programme and then a movement from about 1986 to the present (35 years) by maintaining its relevance through adaptive management responses.[7]

7 Barrow, E. (2014). '300,000 Hectares Restored in Shinyanga, Tanzania — but what did it really take to achie this restoration?'. *SAPIENS* 7(2). https://journals.openedition.org/sapiens/1542

Criterion 8: NbS are sustainable and mainstreamed within an appropriate jurisdictional context

Guidance:

This Criterion requires that NbS interventions are designed and managed with a view to long-term sustainability and that they take account of, work with and align with sectoral, national and other policy frameworks.

There are various approaches to mainstreaming NbS; however, all rely on strategic communications and outreach. Audiences to consider include individuals (e.g. the public, academics), institutions (e.g. national government, start-ups, businesses, and organisations) and global networks (e.g. Sustainable Development Goals, Paris Agreement).

Indicators

8.1 The NbS design, implementation and lessons learnt are shared to trigger transformative change
Guidance: Transformative change can be characterised by scaling up (policy or programmatic mainstreaming), scaling out (expansion at the geographical or sectoral level) or replication of the NbS. Consequently, it is important that the process of design and implementation captures, documents and makes available lessons learnt to individuals and stakeholders interested in replicating the process. This includes decision makers, investors and other NbS users from the public and private sectors.

8.2 The NbS informs and enhances facilitating policy and regulation frameworks to support its uptake and mainstreaming
Guidance: The implementation of NbS is subject to a range of pre-existing policies, laws and sectoral regulations, some of which may not be consistent or mutually reinforcing. In some situations, inconsistent policies and regulations may limit the effective rollout of NBS or, worse, actually contribute to the loss of important ecosystem functions over time. In such situations, it is important to a) be aware of policy, regulatory and legal limitations and b) work with local and/or national decision makers as well as other key stakeholders, to highlight such obstacles and identify effective responses or other enabling solutions.

8.3 Where relevant, the NbS contributes to national and global targets for human well-being, climate change, biodiversity and human rights, including the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP)
Guidance: NbS can make significant contributions to national economic, social and conservation targets and help achieve national commitments to international processes on climate change, human rights, human development and biodiversity. Making these linkages explicit, documenting and communicating them, help further reinforce the profile and role of NbS nationally, secure broad-based and durable political commitment as well as societal support, thereby enhancing the long-term sustainability of the intervention.

Mainstreaming and sustainability

Figure 18 Sustainability of a solution is greatly enhanced when it provides tangible contributions to national and global commitments such as SDGs © UN

Figure 19 Reforesting mangroves in the Paz River basin of El Salvador. Local people depend on the wetlands and mangroves for fishing, wood and firewood. © Orsibal Ramirez/IUCN.

Case study: El Salvador's Bonn Challenge

El Salvador has pledged to restore 1 million hectares of land by 2030, through a Bonn Challenge commitment. In December 2018, a total of 122,093 hectares are under restoration via 227 restoration projects, using Forest Landscape Restoration (FLR). The associated benefits include direct and indirect jobs, estimated emissions reductions of 3,647,060 tCO2e, and approximately 32,812 ha restored in protected areas or key biodiversity areas (KBAs), in an effort to reverse biodiversity loss. FLR directly contributes to 10 different national policies, plans and strategies of El Salvador and actions are facilitated through the country's National Ecosystem and Landscape Restoration Programme, which seeks synergies amongst the 10 policies, etc. to mobilise action at scale (time and space). Entities such as the Cabinet for Environmental Sustainability and Vulnerability as well as the National Council for Environmental Sustainability and Vulnerability serve as mechanisms for coordination, learning, adaptive management and importantly, for institutionalising FLR as an NbS for climate change impacts. The FLR target is part of the country's national commitment to the UNFCCC (National Action Plan for Climate Change).[8]

8 Dave, R., Saint-Laurent, C., Murray, L., Antunes Daldegan, G., Brouwer, R., de Mattos Scaramuzza, C.A., Raes, L., Simonit, S., Catapan, M., García Contreras, G. et al. (2019). *Second Bonn Challenge progress report. Application of the Barometer in 2018*. Gland, Switzerland, IUCN. https://doi.org/10.2305/IUCN.CH.2019.06.en

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