State of ENACT NbS Goals Report: Year One Roadmap

A Report by the ENACT Partnership – Enhancing Nature-based Solutions for Accelerated Climate Transformation

INTERNATIONAL UNION FOR CONSERVATION OF NATURE

ENACT PARTNERSHIP FOR NBS

Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection

Ministry of Environment

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ACKNOWLEDGMENTS

The International Union for the Conservation of Nature (IUCN) would like to thank the report's contributing authors and reviewers, of whom there were many among the ENACT Partners, for their role in the development of this report. The individuals mentioned contributed to the production of the report. Contributors and reviewers worked in their individual capacities and their affiliations are only mentioned for identification purposes.

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This report was made possible through the generous contributions of ENACT's donors: International Climate Initiative (IKI) of the German Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV)

Produced by: Climate Change Team - Center for Finance and Economicse
Cover picture: © Jame_9bkk - www.pexels.com
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FOREWORD

The interlinked crises of climate change, biodiversity loss and land degradation threaten to exacerbate human inequality and disrupt efforts to ensure human well-being, unless an integrated approach to these challenges is rapidly implemented. In recognition of this, the ENACT Partnership was launched at the 27th UN Climate Change Conference (UNFCCC COP27), with the Egyptian COP Presidency and Germany as co-chairs. This inaugural ENACT report provides a foundation for the way forward. ENACT Partners stand at the intersection of environmental conservation, sustainable development, and global cooperation, convening state and non-state actors who recognise the critical need for collaborative solutions.

Nature-based Solutions (NbS), rooted in the principles of enhancing nature's inherent capacities to address societal challenges, offer a promising path towards a globally agreed integrated approach. For this reason, NbS are now recognised across The Rio Conventions – the United Nations Framework Convention on Climate Change (UNFCCC), the Convention on Biological Diversity (CBD), and the United Nations Convention to Combat Desertification (UNCCD) – under which a set of interlocking multilateral agreements have been built. These include the Paris Agreement, Sharm El Sheikh Adaptation Agenda, the Kunming-Montreal Global Biodiversity Framework, land degradation neutrality targets, and more.

Despite commitments and advancements towards integration made under these agreements, governments and funders continue to provide investments in a siloed fashion. This means that funds and efforts directed at addressing climate change may not always include assurances for enhancing ecosystem integrity nor human well-being. As emphasised in this report, NbS developed in accordance with the UNEA 5/5 Resolution definition offer a facilitative tool to guide funds and the efforts they support towards achieving integration.

This inaugural report of the ENACT Partnership builds upon the rich expertise and diverse perspectives of our global partners and serves as a testament to the potential for the collaborations needed to push forward transformative change. Through accessible synthesis, system-specific analysis and case studies, and an appraisal of the current capacity to measure the true impact of verified NbS, this report concludes with a set of three key messages and related actions to catalyse implementation of NbS across ecosystems and for communities.

First, the ENACT Partners call for policy and practice-level support towards **integration of actions on climate change, biodiversity loss and land degradation to support human well-being, in line with** the UNFCCC COP28 Joint Statement on Climate, Nature and People, led by the UNFCCC COP28 Presidency, CBD COP15 Presidency, and chairs of 10 global partnerships including ENACT.

Second, ENACT Partners recognise that **funding and investment to support an integrated approach must be increased to realise the full potential of NbS**.

Finally, ENACT Partners emphasise that **all NbS must ensure inclusive decision making, and should therefore emerge from policy processes and investment decisions that have a corresponding level of inclusion to achieve maximum equitable and socially just outcomes**.

The cross-sectoral and multi-scaled convening efforts of the ENACT Partnership, channelled into focused bridge-building across the Rio Conventions, is one step towards achieving this objective. The organisation of the ENACT Workstreams, to kick off in 2024 with sufficient resourcing, will be a concrete step in furthering this work.

As we advance through the complex terrain of sustainable development, it is clear that no single entity or convention can address the challenges we face alone. It is through forging meaningful connections, fostering dialogue, and embracing holistic approaches that we can truly unlock the full potential of NbS and advance the objectives of the Rio Conventions. We extend our deepest gratitude to all those who have contributed to this endeavour by becoming an ENACT Partner. It is through your dedication and commitment that we continue to strive towards a future where nature thrives, societies flourish, and our planet is resilient for generations to come.

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FOREWORD

EXECUTIVE SUMMARY

The ENACT NbS Goals annual report series is a publication of the ENACT Partnership to inform Rio Convention processes and shape the collective global agenda on Nature-based Solution (NbS). While interest in the potential of NbS is growing, gaps remain in achieving and communicating effective implementation. Following structured consultation with ENACT founding partners and additional targeted actors, the inaugural report addresses three key reasons for this gap. First, confusion about what counts as NbS and thus controversies emerging from its misapplication (Introduction). Second, limited targeted and contextualized collected overviews and case studies on system-focused implementation of NbS in relation to climate change and biodiversity (Synthesis). Third, limited clarity on the status of achieving the full potential of NbS to address climate change, biodiversity loss and land degradation in an integrated way (Impact).

The inaugural ENACT NbS Goals Report lays the foundation to address these three factors. It charts engagement with UNEA 5/5 resolution on NbS and the IUCN Global Standard on NbS as the key existing frameworks guiding global alignment on NbS. It emphasises that NbS are not a substitution for achieving emissions reductions in line with the best-available science and the Paris Agreement, nor are they implemented without full consent and equitable participation of affected Indigenous Peoples and local communities. Finally, it establishes the case that NbS addressing the challenges and risks of climate change must simultaneously enhance biodiversity and ecosystem integrity.

The first section of the inaugural report provides a broad synthesis of the current state of knowledge on the themes of the ENACT Goals:

- Climate Change Adaptation: Enhanced protection and resilience of at least 1 billion vulnerable people (including at least 500 million women and girls).
- Enhancing Biodiversity: Up to 2.4 billion hectares of ecosystem integrity secured through protection of 45 million ha, sustainable management of 2 billion ha, and restoration of 350 million ha.
- Climate Change Mitigation: Significantly increased global mitigation efforts through protecting, conserving, and restoring carbon-rich terrestrial, freshwater, and marine ecosystems.

It relies on data from recent IPCC and IPBES reports, as well as sector-specific peer-reviewed research and highlights that NbS provide a higher rate of synergies than trade-offs in reducing the impact of climate change and providing for broader ecological and social resilience (Chausson, et al. 2020). Further, NbS focused on protecting existing high-biodiversity and carbon-dense ecosystems (halting deforestation, for example) provide the most effective integrated approach (Arneth, et al., 2020). This section emphasizes, that while the overall contribution of NbS to global goals for climate, nature, and people are significant, the potential total contribution to climate change mitigation is far smaller than what is needed, therefore drastic cuts to fossil fuels must occur alongside their implementation.

The second section of the report presents the ENACT workstreams, which correspond to the High-Level Champions Sharm-el-Sheikh Adaptation Agenda (SAA) by aligning across systems. This achieves the aim of ENACT to build synergies and strengthen collective action for NbS to address the challenges of climate change, biodiversity loss, and land degradation. These sub-sections of the report are led by systems experts and in addition to focusing on the state of knowledge also present discussions of measuring and assuring impact, as well as identifying key research needs. Where available, each sub-section presents case studies of good practices which have undergone the IUCN Global Standard Self-Assessment and are featured on the PANORAMA Platform.

The third section seeks to increase clarity on the status of monitoring NbS implementation in relation to climate change adaptation, biodiversity enhancement, and climate change mitigation. The inaugural report discusses

the current capacity to track the achievement of the ENACT NbS Goals. The work that informed this section will undergird the process of establishing baselines for the 2024 report. This work is developed in collaboration with the IUCN Contributions for Nature Platform.

In addition to laying the foundation for the State of ENACT NbS Goals Report series, the Roadmap Report offers three key messages and associated actions for assuring progress toward the ENACT Partnership vision:

Integrate action on climate change, biodiversity loss, land degradation and human well-being through:

- Support of a whole-of-government approach that mainstreams NbS;
- Support the development of globally-agreed standardized indicators and tools for tracking integrated progress on global targets for nature and people through NbS;
- Support coherence and accessibility of NbS monitoring data at a global scale, ensuring methodologies encourage an integrated approach.

Enhance the design of funding and investment to support an integrated approach to climate change, biodiversity loss, and land degradation through:

- Ensuring that NbS has priority allocation in the mobilization of concessional finance towards the USD 100 billion goal to support developing countries in their climate objectives through to 2025;
- Increasing and enhancing the impact of bilateral and multilateral funding mechanisms in supporting of an integrated approach; and
- Investing in enhancing a joint understanding of the benefits of NbS to support confidence among practitioners and decision-makers in implementation across the sustainable development field.

Ensure inclusive decision making on all policy processes, investment decisions, and implementation design related to NbS through:

- Prioritizing the increase of gender-responsive funding aimed at and accessible to women and girls, as well as funding for Indigenous People’s led work;
- Increasing the capacity to communicate good practices on gender-responsive and Indigenous Peoples-led planning and budgeting in NbS; and
- Investing in women and Indigenous Peoples-led efforts, sectors, and collaborations toward an integrated approach.

These will serve as the basis for establishing the 2024 work plan of the Partnership, which will be discussed and determined through a collaborative process at the inaugural steering committee meeting in the second quarter of 2024

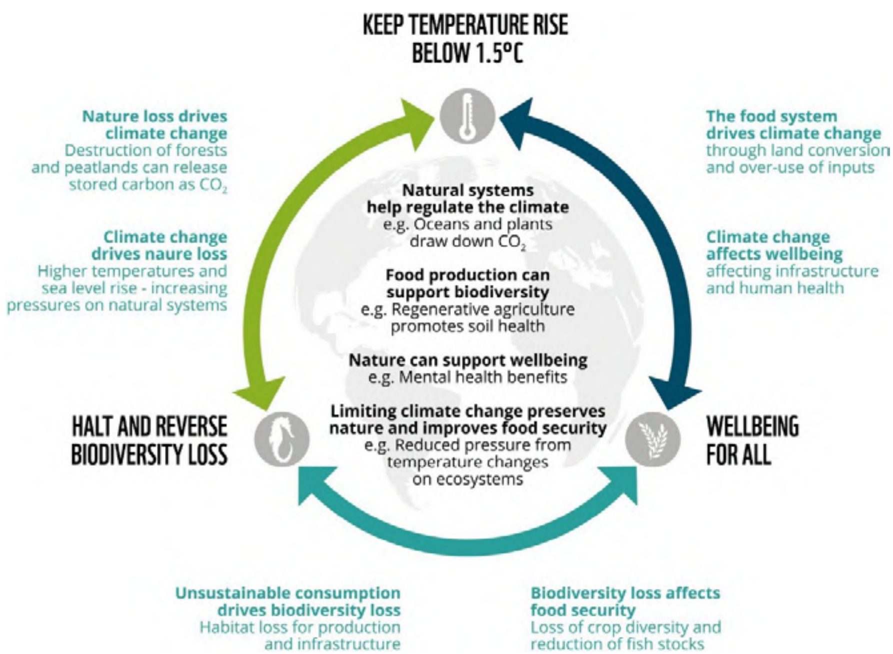
INTRODUCTION

This report represents a roadmap towards the ENACT partnership's annual 'State of ENACT NbS Goals' Reports. The goal of these reports is to outline an annual 'state-of-play' on the ENACT partnership's 3 goals, and to highlight ENACT partners' success in applying NbS to key ENACT NbS workstreams.

RESPONDING TO THE INTERLINKED CLIMATE CHANGE, BIODIVERSITY LOSS & LAND DEGRADATION CRISES

The scientific evidence of the recent assessment reports of the Intergovernmental Panel on Climate Change (IPCC) and Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) is clear: this decade represents a critical window for addressing the interlinked crises of climate change, biodiversity loss, and land degradation. While these bodies previously set out narratives addressing these crises in isolation, the AR6 Synthesis Report builds more directly from the established evidence of the IPCC Special Report on 1.5°C (2018) and Special Report on Climate Change and Land (2019) to discuss the need for an integrated approach.

Figure 1: Climate, biodiversity, and human society are coupled through dynamic interactions across scales. Source: (Pörtner, et al., 2023)



Due to the interconnectedness of these crises, it is essential an integrated approach is taken to address the challenges of climate change, biodiversity loss, and land degradation, and to do so in a socially and economically equitable way. Nature-based Solutions (NbS) are a tool that offer this integrated approach because they are not single-issue actions but "place-based partnerships between people and nature" (Seddon et al., 2021). When implemented properly, NbS enhance the resilience of ecosystems and the societies that depend on them. NbS can support adaptation to climate hazards such as sea level rise, more frequent and intense flooding, droughts, heatwaves, and wildfires, while delivering significant biodiversity benefits in a manner that safeguards and promotes the rights and interests of vulnerable and historically marginalized communities.

While the potential for NbS to deliver on this promise is widely recognized (Pörtner et al., 2021), to date, global efforts to implement NbS have been largely uncoordinated and disconnected. At the global level, government expenditure on actions that degrade nature is 3-7 times higher than combined public and private investment in NbS (UNEP, 2022a). And even as worldwide interest in NbS grows, there is still an inconsistent understanding across sectors about what qualifies as NbS, how to build policy incentives to drive action, and how nature can be used to effectively deliver integrated climate-biodiversity results (Seddon et al., 2020).

THE ENACT PARTNERSHIP

At the Sharm el-Sheikh 27th Conference of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC COP27) in December 2022, the Egyptian COP Presidency launched the ENACT Partnership: 'Enhancing Nature-based Solutions for Accelerated Climate Transformation'. This ambitious partnership, developed in collaboration with the Government of Germany and International Union for Conservation of Nature (IUCN), established a global coalition of state and non-state actors to address the gaps in coherence and collaboration in promoting and implementing NbS.

To devise the partnership, 59 state and non-state representatives were convened to co-design its vision and scope, and to develop clear and purposeful action-based targets to guide strategy and track progress. It was agreed that ENACT should aim to accelerate efforts to address the climate, biodiversity and land degradation crises jointly by setting a common action agenda on Nature-based Solutions (NbS). Furthermore, with the aim of driving resources and action, participants agreed that ENACT should set goals focused on accelerating implementation and finance toward the achievement of existing targets across the UNFCCC and CBD frameworks, rather than call for new pledges or commitments.

Therefore, ENACT is designed as an enabler and accelerator of progress towards multilaterally established global targets including the UN Decade on Restoration, the Kunming-Montreal Global Biodiversity Framework (GBF) adopted under the Convention for Biological Diversity (CBD) (2022), the Paris Agreement under the UN Framework Convention on Climate Change (UNFCCC) (2015), and the G20 Global Initiative on Land Degradation under the UN Convention to Combat Desertification (UNCCD) (1994).

As emphasized by its name, the ENACT Partnership aims to advance the necessary alignment of integrated climate and biodiversity action with transformative change. ENACT adopts the IPBES Global Assessment (2019) definition of transformative change as: 'a fundamental, system-wide reorganization across technological, economic and social factors, including paradigms, goals and values.' To adequately address climate change, biodiversity loss, and land degradation while enhancing social equity, an unprecedented social and economic transformation must occur across all sectors – energy, agriculture, land use, transportation and beyond. The ENACT Partnership works to advance NbS as an integral component of achieving that transformation.

As a result of consultations, and in agreement to align with the Sharm el-Sheikh Adaptation Agenda Global Outcome Targets, the following three ambitious 2030 ENACT NbS Goals were adopted, with 2024 set as the baseline year. The language of these goals highlight that NbS goes beyond traditional conservation and functions at the intersection of nature and people.

- **Climate Change Adaptation:** Enhanced protection and resilience of at least 1 billion vulnerable people (including at least 500 million women and girls).
- **Enhancing Biodiversity:** Up to 2.4 billion hectares of ecosystems and their integrity secured through the protection of 45 million ha, sustainable management of 2 billion ha, and restoration of 350 million ha.
- **Climate Change Mitigation:** Significantly increased global mitigation efforts through protecting, conserving and restoring carbon-rich terrestrial, freshwater, coastal and marine ecosystems.

ENACT has set a clear and streamlined vision to provide a collective voice for evidence-based policy and practice on NbS for climate change, land degradation and biodiversity loss, and to leverage support for the integration of NbS across all the Rio Conventions.

FRAMING NATURE-BASED SOLUTIONS (NbS)

In March 2022, the United Nations Environment Assembly (UNEA) achieved a crucial milestone by formally defining Nature-based Solutions (NbS), marking a pivotal moment in environmental policy and action. The Assembly resolved to adopt UNEP/EA.5/Res.5. The ENACT Partnership works in close alignment with this resolution, and has also adopted the UNEA definition of NbS, which states that NbS are: 'Actions to protect, conserve, restore, sustainably use and manage natural or modified terrestrial, freshwater, coastal and marine ecosystems which address social, economic and environmental challenges effectively and adaptively, while simultaneously providing human well-being, ecosystem services, resilience and biodiversity benefits'. The UNEA definition builds on IUCN's own formal definition of NbS adopted at the 2016 World Conservation Congress and Member's assembly (WCC-2016-Res-069), which, for the first time, defined the use of nature to include the simultaneous provision of benefits to biodiversity and human well-being. This definition, together with the NbS principles (Cohen-Shacham, 2019) were the cornerstone for guiding the development of the IUCN Global Standard for Nature-based Solutions™. The Global Standard is a facilitative framework of eight Criteria and 28 Indicators for the verification, design and scaling up of NbS (IUCN, 2020). As an integrated approach, NbS are not single-issue actions, they are "place-based partnerships between people and nature" (Seddon, et al., 2021).

While NbS can be developed to address one or more societal challenge - water security, food security, human health, economic and social development, disaster risk, climate change - the ENACT Partnership's approach to NbS emphasizes that addressing climate change should be an overarching objective, in the same way that biodiversity benefits are centralized. This implies adding a dimension of climate change risk assessment as a component of IUCN's Global Standard for NbS approach, among other inclusions.

Figure 2: Defining Nature-based Solutions © IUCN

Within the context of climate change, NbS is an umbrella term for a wide range of approaches, actions and interventions that involve enhancing and working with and for nature to help both mitigation and adaptation. NbS are designed to yield benefits at the intersection of society and ecosystems through context-specific approaches.

While NbS may contribute significantly to climate action, they do not replace the need for rapid, deep and sustained reductions in greenhouse gas emissions. Moreover, the sustained provision and effectiveness of NbS benefits are reliant on achieving the 1.5°C target through rapid reductions in fossil fuel use, as climate impacts reduce the capacity of ecosystems to deliver such benefits.

One of the primary misconceptions is that actions designed exclusively for climate change mitigation, such as monoculture forest plantations, count as NbS. These actions, which reduce ecosystem integrity, as well as social wellbeing, do not meet the NbS definition provided by the UNEA 5/5 resolution, nor the criteria of IUCN's Global Standard for NbS. The work of the ENACT Partnership aims to increase coherence and assurance regarding which actions qualify as NbS at a global level to guide scaled-up implementation of NbS worldwide, that can benefit nature and people while minimizing and reducing negative trade-offs.

POLICY RELEVANCE

The official recognition of NbS by the UNEA 5/5 Resolution in 2022 was a landmark moment for NbS, which was followed by the term being included in the UNFCCC COP27, CBD COP15, and UNCCD COP15 decision texts. ENACT's inception at COP27 means it is well placed to build upon and maintain the political momentum marked by these achievements, to accelerate uptake of NbS in a way that aligns with the UNEA 5/5 Resolution both within the UNFCCC and across the CBD and UNCCD COPs. The consistent recognition of NbS across each of the Rio Conventions will set an important global precedent that climate change, biodiversity loss and land degradation are linked challenges that sit at the intersection of society and the environment, and therefore require integrated approaches that tools such as NbS can provide (Bulkeley et al., 2023).

Coherence and alignment on a global scale allows governments to ensure greater oversight and accountability on the use and application of NbS. Formal recognition can also help overcome barriers that are often found in the financing of NbS and provide the regulatory policy framework needed for them to succeed.

The second edition of Nature4Climate's Nature-based Solutions Policy Tracker indicates a promising growth trend in the adoption of policies supporting NbS. The Tracker documents 462 policies in 144 countries and maps NbS relevant targets in 31 countries' international nature and climate commitments to the international community, such as Nationally Determined Contributions (NDCs), National Adaptation Plans (NAPs), and National Biodiversity Strategies and Action Plans (NBSAPs). This data emphasizes the significance of international commitments for enhancing national policy frameworks and spurring financial mechanisms and knowledge sharing for increased capacity at the level of implementation (Nature4Climate, NbS Solutions Policy Tracker, 2022).

Despite progress there is still a lack of documented interventions that align with a uniform and verified standard of NbS, such as the IUCN Global Standard on NbS. ENACT seeks to advance on progress in this area through facilitating knowledge transfer and exchange networks among policymakers and practitioners in NbS. The development of this report marks the inception of this work by establishing a roadmap to baseline measurements of verified NbS impacts. It also begins and builds from ENACT's focus on collaboration and strengthening networks of research and action.

There are additional actions necessary to ensure that the aim of increasing documentation of verified NbS interventions is linked to the reciprocal vision of fostering alignment across the Rio Conventions. Ahead of COP28, researchers from Durham, Utrecht, Oxford, and Radboud Universities came together with the PBL Netherlands Environmental Assessment Agency in collaboration with UAE to develop a set of 10 proposals for integration of the climate change and biodiversity policy and action agenda (Bulkeley et al, 2023):

1. Strengthen and safeguard the use of Nature-based Solutions
2. Address the indirect drivers of climate change and biodiversity loss
3. Align national planning, particularly NDC, NAPs, and NBSAPs
4. Establish a common strategic roadmap on finance
5. Focus on transformative change
6. Bring biodiversity into the Race to Zero and Race to Resilience
7. Integrate membership across UNFCCC & CBD action agendas
8. Create a common reporting platform
9. Develop shared principles for financing
10. Support the UN Resident Coordinator Systems convening power to align policies

ENACT works in support of achieving these proposals. Ahead of COP28, the ENACT Partnership worked alongside the NDC Partnership, the UAE as the UNFCCC COP28 Presidency, and the People's Republic of China as the UN CBD COP15 Presidency to develop the COP28 Joint Statement on Climate, Nature and People to facilitate stronger international, regional, and local cooperation to implement integrated action on climate change and biodiversity loss. The joint statement was endorsed by nearly 20 countries noting their roles in select, relevant partnerships, initiatives and coalitions.

Building from these collaborations, in 2024 the partnership will work to establish the baselines for monitoring progress toward the ENACT NbS Goals. This report outlines the current capacity to track NbS for climate change and biodiversity outcomes, with the intention to pave the way for comprehensive baselines to be established in the future. The goal of the report is therefore to establish clear and credible claims related to NbS, including through identifying key gaps in monitoring and evaluation related to specific NbS interventions.

While interest in the potential of NbS is growing, gaps remain in achieving and communicating effective implementation. This report aims to address three principal reasons for this gap. First, confusion about what counts as NbS and thus controversies emergent from its misapplication, addressed in the Introduction and Synthesis sections. Second, limited clarity on the status of achieving the full potential of NbS to address climate change, biodiversity, and land degradation concerns, discussed in the Synthesis and Impact sections. Third, limited publicly available guidance, technical assistance, and case studies on system-focused implementation of NbS, addressed in the Analysis section. Both the aim and the method of the report have been developed through direct consultation with ENACT founding Partners, and structured consultation processes with additional targeted actors.

SCOPE AND METHODOLOGY

The inaugural State of ENACT NbS Goals Report sets the agenda necessary to address the three factors outlined above. The report emphasises the importance of NbS in alignment with UNEA 5/5 resolution on NbS and the IUCN Global Standard on NbS. This report reemphasises that NbS are not a substitute for emissions reductions, nor can they be implemented without full consent of affected Indigenous Peoples and local communities. Further, NbS must always simultaneously enhance biodiversity when they address climate change.

The Introduction has provided this narrative framing for NbS, while the Synthesis section provides an overview of scientific and related policy knowledge with regard to the goals of ENACT on NbS and adaptation, biodiversity net gain, and mitigation based on a non-systemic review of the scientific literature. The Analysis section of the report covers the current state of play on implementing NbS across the ENACT workstreams which align with the Sharm El-Sheik Adaptation Agenda. The workstreams were adopted to facilitate the future ambitions of the ENACT Partnership to more directly support NbS implementation, and the context-specific guidance necessary for this. This section will discuss the current best knowledge on each workstream in relation to the ENACT NbS Goals and outline the priority directions for investment and re-

1 ENACT Partners wish to recognize that the use of the term 'Indigenous Peoples', while aligned across the global policy processes this document intends to engage, is not consistently adopted nor used among all ENACT partners.

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search. It will further present IUCN Global Standard-aligned implementation of projects within each workstream. These sections are led by a group of expert-practitioners in the specific field and will thus initiate ENACT workstream working groups to take forward the priority actions identified in this inaugural report.

Finally, to increase clarity on the status of NbS implementation, the Impact section of the inaugural ENACT NbS Goals Report will focus on the ENACT NbS Goals and set the knowable baselines for their achievement. The achievement of the ENACT Goals will be facilitated through the 'ENACT-ing a Billion' Campaign. In this initial report the section has been developed in collaboration with the IUCN Contributions for Nature Platform, with its current capacity to track IUCN member contributions to carbon sequestration and biodiversity net gain, and track beneficiaries along with other possible adaptation indicators.

Overall, this report represents a roadmap towards the partnership's annual 'State of ENACT NbS Goals' Reports, which will be central to this goal by providing clear cross-policy messaging and good practice analysis of NbS.

SYNTHESIS

State of Knowledge on ENACT NbS Goals

FRAMING AN INTEGRATED APPROACH

There is growing awareness globally that climate change, biodiversity loss, and the decline of human well-being are linked crises that demand an integrated solution (Baldwin-Cantello, et al., 2023). Nature-based Solutions (NbS) provide an integrated solution by working at the link between communities and the ecosystems upon which they depend.

The focus of NbS are on fostering ecosystem integrity, defined as: “the ability of ecosystems to maintain key ecological processes, recover from disturbance and adapt to new conditions” (Pörtner, et al., 2022). The IPCC Working Group III (WGIII) report on climate change mitigation explains that ecosystem integrity provides the long-term ability of ecosystems to lock up carbon and maintain or increase resilience for adaptation (Nabuurs, et al., 2022).

In adherence to the IUCN Global Standard for NbS, NbS actions must be designed in response to an evidence-based assessment of the current state of the ecosystem and the drivers of biodiversity loss (indicator 3.1, NbS Standard), with clear and measurable biodiversity conservation outcomes identified, benchmarked and periodically assessed (indicator 3.2, NbS Standard). The outcome of NbS should achieve net biodiversity and ecosystem integrity gain, as well as having no negative impacts to the most disadvantaged elements of society or that they are denied access to intervention benefits (indicator 6.1, NbS Standard).

As an integrated approach NbS are not single-issue actions, they are “place-based partnerships between people and nature” (Seddon, et al., 2021). As previously stated, actions designed exclusively for mitigation and do not explicitly conserve nor enhance ecosystem integrity nor human well-being, do not meet the NbS definition provided by the UNEA 5/5 resolution, nor the criteria of IUCN’s Global Standard for NbS. Where climate change mitigation is part of the chosen priorities for the NbS applied, the intervention should be designed to address the drivers of biodiversity loss and aim to improve the state of biodiversity, resulting in biodiversity net gain and enhanced ecosystem integrity along with targeted social outcomes. NbS prioritize the protection and improvement of natural systems and people’s resilience in the face of climate hazards. This is achieved by reducing exposure to the immediate impacts of climate change, lowering social sensitivity to climate impacts and building adaptive capacity (Seddon, et al, 2020).

Importantly, integrated action requires that NbS are pursued alongside a parallel effort to address climate change which prioritizes rapid emissions reductions across all sectors in alignment with the goals of the Paris Agreement. As outlined by Nature4Climate, it is a common misconception that NbS can be substitute for emissions reductions (Nature4Climate, 2023). Emissions reductions are imperative for the viability of NbS, as under higher emission scenarios and a +2°C world, NbS will have a significantly reduced capacity to provide the social and ecological benefits for which they are designed.

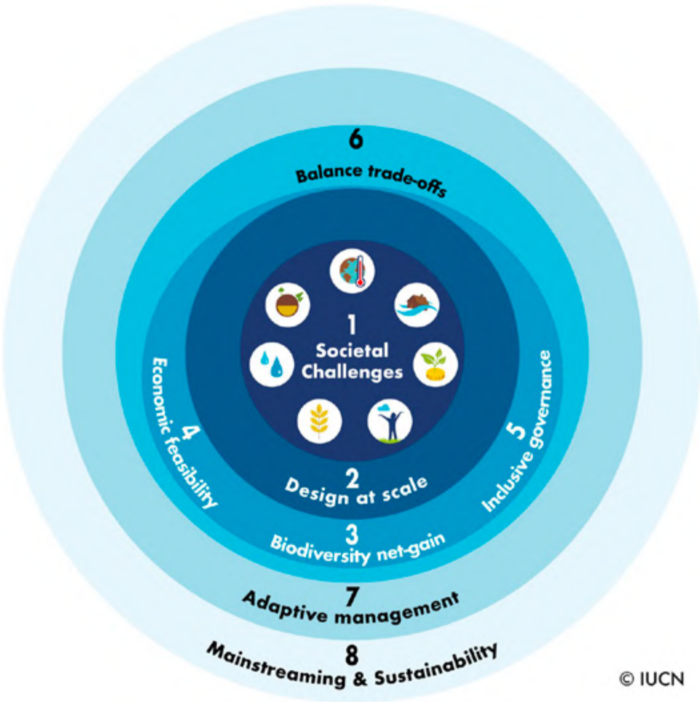

Figure 3: The eight Criteria that make up the IUCN Global Standard for NbS are all interconnected (IUCN Global Standard).

SYNTHESIZING KNOWLEDGE ACROSS THE ENACT NBS GOALS

CLIMATE CHANGE ADAPTATION

The latest IPCC Working Group II (WGII) report on Impacts, Adaptation and Vulnerability makes greater strides in integrating knowledge from across the natural, social, and economic sciences than previous assessments. In asserting the risk of climate change to the interdependent systems of climate, ecosystems and biodiversity, and human societies it emphasizes how vulnerabilities and risks are linked across these systems (Pörtner, et al., 2022). Beyond discussing their vulnerabilities, the report also outlines the role of ecosystems and biodiversity in reducing climate risks. NbS and corresponding practices such as ecosystem-based adaptation are mentioned 457 times in the report and are emphasized as an approach to build social-ecological resilience based on clear evidence that they can reduce the risks climate change presents to people.

Building climate resilience across social-ecological systems is most immediately important in the most climate vulnerable countries. The effects of climate change are felt to varying degrees across the globe, with Africa, Central America, South Asia, and small island states facing the worst present conditions, as well as those anticipated in future projections. This threatens to exacerbate existing inequalities both within and between countries, particularly for low-income countries where direct dependency on ecosystems for food and income is elevated (Uy et al., 2012).

NbS focus on strengthening social-ecological systems by enhancing and stewarding the important links between biodiversity and social resilience. This provides both short and long-term benefits through immediate increases in ecosystem services[2] and the assurance of ecosystem integrity over time, reducing the impact of shocks and enabling better recovery (Cardinale et al., 2012; Tilman et al., 2012).

Reduction of impacts to ecosystem integrity through NbS can, in turn, reduce climate change impacts on individuals and communities (Valenzuela et al., 2020). For example, NbS actions can be designed to enhance the diversity of food and income to ensure alternatives if certain crops or livelihood strategies become affected by climate extremes (Ahammad et al., 2013; Seddon, et al., 2020; Waldron et al., 2017). NbS can also enhance resilience through strengthening the institutional and technical capacity for people and communities to govern and manage ecosystems. This occurs through participatory design and project ownership (criterion 5 of the Global Standard), which helps ensure the long-term stewardship of ecosystems (Valenzuela et al., 2020).

The IPCC WGII report discussion of NbS provides a thorough elaboration of NbS benefits for climate adaptation, as well as challenges. These include, for example, a focus on the importance of integrating NbS into urban infrastructure to build resilience, while noting that this emergent field demands particular focus to ensure design and implementation occur that does not exacerbate urban spatial or economic exclusions. Related, the report notes the need and possibility of building climate adaptation monitoring and evaluation frameworks that integrate climate justice, as well as the links between human and ecosystem resilience. One such existing resource is the Guidebook for Monitoring and Evaluating Ecosystem-based Adaptation Interventions. Resources such as these need to be expanded and mainstreamed to ensure progress and innovations in NbS correspond to the broader field of adaptation. For additional examples of how NbS can reduce vulnerability to climate change, see Seddon, et al. (2020).

The selection and overall effectiveness of NbS approaches in climate change adaptation and resilience depends on local contexts including social, ecological, and economic factors. While progress toward monitoring climate change adaptation is expected to advance through the Global Goal on Adaptation, adaptation is ultimately a site-specific achievement and, in most cases, irreducible to one clear metric (Seddon, 2022). Despite uncertainties around how to measure adaptation outcomes in general and the existence of a variety of approaches, there is increasing confidence that NbS for adaptation, often called Ecosystem-based Adaptation (EbA)[3], provides necessary resilience across social and ecological systems.

A recent synthesis of NbS for adaptation outcomes concludes that in most cases they are "as effective or more so than alternative interventions for addressing climate impacts" while revealing a higher rate of synergies than trade-offs in reducing the impact of climate change and providing for broader ecological and social resilience (Chausson, et al 2020). Despite this, work remains to be done on evaluating clear evidence for the overall effectiveness and cost effectiveness of NbS over conventional approaches to adaptation, as well as increasing the evidence on NbS effectiveness for building resilience in low- and middle-income countries.

2 Framed under the Nature's Contributions to People (NCP) umbrella concept by IPBES. Nature's Contributions to People (NCP) refers to all contributions – beneficial and detrimental – that people, individually or collectively at various scales, derive or endure from nature (Diaz, et al. 2018)

3 Secretariat of the Convention on Biological Diversity (2019). Voluntary guidelines for the design and effective implementation of ecosystem-based approaches to climate change adaptation and disaster risk reduction and supplementary information. Technical Series No. 93. Montreal, 156 pages.

ENHANCING BIODIVERSITY

The IPCC report indicates just 2°C warming will put 10% of all plant and animal species at high risk of extinction (Pörtner, et al., 2022). Over 12,000 animals, fungi and plants on the IUCN Red List of Threatened Species™, across every region of the world, have climate change and severe weather listed as a threat. Monitoring under SDG 15 Life on Land targets further illustrates the dire outlook for biodiversity. The SDG 2023 Report states: "All dimensions of biodiversity, including species abundance, species diversity, and the functioning of ecosystems, are under threat. It has been announced that the current loss of species rate is 1,000-10,000 times more than the natural extinction rate." (Sachs et al., 2023). The 5 direct drivers of biodiversity loss are, in order of largest global impact, land/sea use change, direct exploitation, climate change, pollution, invasive alien species. These are forced by underlying societal causes, which can be demographic (e.g., human population dynamics), sociocultural (e.g., consumption patterns), economic (e.g., trade), technological, or relating to institutions, governance, conflicts, and epidemics (IPBES, 2019).

In addition to their intrinsic value, species play essential roles in ecosystems, which in turn provide a suite of values to humans. Given the integral link between biodiversity, ecosystem integrity and human wellbeing, any NbS must support or enhance biodiversity. This is not a burden of NbS design, but imperative for its success as NbS is underpinned by biodiversity. Many threatened and endangered species are found in areas where biodiversity and carbon hotspots overlap. For example, grassland species are among the most endangered in the world, with a recent study showing a decline of 53% in grassland bird populations in North America since 1970 (Rosenberg, et al., 2019), mirroring declines in grassland species worldwide. The Great Plains of North America have been identified as being of high value for the conservation of species impacted by climate change and for below-ground stored carbon, yet only 4% of the area is legally protected (Stralberg, et al., 2020). Likewise, coastal habitats are not only important for the carbon they store in their substrate and the protection they provide to coastal communities from storm surges and flooding, they also provide critical habitats for commercial and non-commercial fish, invertebrates, and other wildlife (Smith, et al., 2019).

Furthermore, new research is emerging that indicates the importance of animals, in terrestrial, coastal and marine ecosystems, to maintaining the physical, chemical, and biological processes that affect the carbon cycle (Schmitz, et al., 2023). As stated by Schmitz et al. (2023), "wild animals, especially terrestrial and marine mammals and marine fish, also can have consequential effects" on ecosystem carbon capture and storage. Protection of high-biodiversity and carbon-dense ecosystems (stopping deforestation, for example) is widely recognized as the single most effective nature-based mechanism to provide synergistic benefits for biodiversity and climate change in the short term – i.e., by 2030 (Arneth, et al., 2020). Despite their importance, such ecosystems are poorly represented in global protected area networks.

Strategies to enhance biodiversity, whether through ecosystem protection, restoration, or improved and sustainable ecosystem management can provide synergistic benefits over several decades or even hundreds of years depending on the ecosystem. The actual provisioning of benefits of these actions, however, is highly dependent on the quality and design of the intervention (Bullock et al., 2011). NbS provide a framework to account for and implement these considerations to enhance benefits. Ecosystem restoration covers the whole restoration continuum which includes the different phases of restoration, from reducing impacts in urban areas, improving ecosystem management, and repairing ecosystem functions, to working towards native recovery of ecosystems (Gann, et al., 2019). Ecosystem restoration which achieves biodiversity net gain and therefore has the status of an NbS, generate both biodiversity and climate change benefits (Gann et al., 2019).

As highlighted in the Human Rights portion of this report, Indigenous Peoples, local communities, women and youth play a significant role in addressing the global crises of biodiversity loss and climate change including through NbS, and particularly through environmental stewardship. The vast majority of Indigenous Peoples and local communities lands (~90%) are categorised as being in an adequately healthy ecological condition (IUCN, 2021), over a third of critically important intact forest landscapes are on Indigenous Peoples' lands (Fa J. et al., 2020), and over a third of currently identified Key Biodiversity Areas (KBAs) are also found within these lands (WWF et al., 2021).

When designing and planning NbS, it is important to recognize that efforts to slow, halt, and reverse biodiversity loss are not always associated with higher delivery of short-term climate benefits, as compared to approaches with these aims only. Similarly, there are often trade-offs to be considered between maximizing biodiversity gains and human well-being, for example in terms of food security. Biodiversity is essential for climate and social resilience, and the ecosystem integrity that underpins both. The ability for ecosystems to withstand stressors such as climate change, invasive alien species, pollution and new pathogens is strongly determined by ecosystem connectivity and biodiversity at multiple trophic levels (Oliver et al., 2015). Therefore, to maintain healthy, resilient ecosystems that can continue to deliver benefits to people over the long-term, NbS must be explicitly designed to protect or enhance biodiversity.

CLIMATE CHANGE MITIGATION

To limit global warming to 1.5°C, global net zero CO_2 emissions need to be met by 2050, with other greenhouse gas emissions significantly reduced (IPCC, 2023). For a 50% likelihood of this occurring, the remaining global carbon budget is estimated to be 275 $GtCO_2$ from the beginning of 2023. This is equivalent to 7 years of 2023 emissions levels (Friedlingstein et al., 2023).[4]

The risks of climate change are amplified with each incremental increase in temperature beyond 1.5°C, including from wildfire, permafrost degradation, and food insecurity (IPCC 2021). Agriculture, forestry, and other land use (AFOLU) activities account for a large portion of global emissions, contributing roughly 23% between 2007 and 2016 (IPCC 2019). While the proportion of AFOLU emissions has decreased, this has been merely a result of outpaced increases in other sectors.

The biosphere has served to buffer the impact of global emissions, currently acting as a sink for 56% of anthropogenic CO_2 emissions (IPCC 2021). The global distribution of this sink has shifted in the recent decade with the northern hemisphere increasing absorption in comparison to the southern hemisphere (Ciais et al., 2019). This is partially a result of land-cover change and the saturation of the Amazon rainforest carbon sink (Hubau et al. 2020).

4 The following caveats noted by Friedlingstein et al., 2023 are important in considering carbon budget calculations: "Comparison of estimates from multiple approaches and observations shows the following: (1) a persistent large uncertainty in the estimate of land-use changes emissions, (2) a low agreement between the different methods on the magnitude of the land CO_2 flux in the northern extra-tropics, and (3) a discrepancy between the different methods on the strength of the ocean sink over the last decade."

The UNEP Emissions Gap Report 2022 sets out the dire present condition, stating: "Current policies put the world on track to reaching a disastrous 2.8°C warming by 2100. Current Nationally Determined Contributions (NDC) targets, if implemented, would still lead to around 2.4°C warming by 2100. Even taking the net-zero pledges of many countries into account, best case scenarios given current pledges would lead to around 1.8°C warming by 2100" (UNEP Emissions Gap Report, 2022).

There are several synthesis reports estimating the potential of NbS to provide for climate change mitigation (as summarized in Seddon, 2022). Many of these studies are reviewed in the Nature-based Solutions for Climate Mitigation report produced jointly by IUCN and UNEP (2021). The report's methodology aimed to estimate the mitigation potential of many individual NbS at a global scale while avoiding double-counting resulting from the land requirements of various options. This involved the use of a typology of options adopted from Griscom et al. (2017) and included analysis of the level of inclusion of the IUCN Global Standard on NbS criteria. However, it merits note that full assurance of the IUCN Global Standard cannot be foretold from modelling and requires full integration and monitoring of an implemented solution.

The synthesized reports indicated a consistent total annual mitigation potential from the protection of natural ecosystems: 3.4 $GtCO_2e$ at 2030 to 4.6 $GtCO_2e$ at 2050. The greatest mitigation potential is found in the avoidance of forest conversion. Robust safeguards to prevent leakage are necessary to ensure the full potential of avoidance. Additionally, forest ecosystems account for the greatest mitigation potential as compared to other ecosystems, representing 62% (58-65%) at 2050 of annual mitigation potential by 2050. Response options based in croplands and grasslands, including agroforestry, provide the second highest contribution in most of the synthesis studies, around 24% by 2050 (22-28%). Given the relatively small global area of degraded and threatened peatlands, their potential contribution to mitigation is very high, 10% of the total by 2050 (9-11%). Finally, coastal wetlands (conservation and restoration of mangroves, salt

Gambia © UNEP

SYNTHESIS

marshes, and seagrasses) represent around 4% by 2050 (3-4%) of the total mitigation potential. In comparison, the synthesis studies reviewed identify a striking range of total annual mitigation potential of NbS (UNEP & IUCN, 2021). This range is a result of variations in the studies' assumptions about how quickly different types of NbS can provide mitigation benefits. One study has estimated that NbS has the potential to reduce the peak of the +2°C warming trajectory by 0.3°C (Girardin et al., 2021). However, this serves as a reminder that all forms of mitigation need to be implemented at their maximum capacity to limit global temperature rise to no more than +1.5°C, when comparing to current trajectories of +3°C by 2100.

While these studies provide useful estimates, there are broader research gaps in the direct study of the mitigation impact of Nature-based interventions (i.e., changes to aboveground carbon storage and/or sequestration, GHG emissions) compared to changes in proxy outcomes (i.e., land cover, use, condition), which need to be addressed (Cheng et al., 2023). In addition to emphasizing the fact that the potential for NbS to deliver mitigation benefits is directly linked to a priority of rapid GHG emissions reductions, it is also essential to avoid the use of NbS to substantiate greenwashing and the de-prioritisation of rapid emissions reductions across all sectors. Overall, discussion of NbS and climate change mitigation potential needs to account for the range of uncertainty. As recent research from Oxford University notes:

> *'Even the most constrained estimates of the contribution of land-based nature-based solutions to global climate change mitigation are highly uncertain. These estimates do not consider the risk of impermanence, as climate change and other anthropogenic stressors can undermine ecosystem health. Nor do they account for the serious problem that scaling up of nature-based solutions in one region can result in the export of ecosystem loss and damage to another (a phenomenon termed "leakage"). Leakage is especially problematic when it results in biodiversity loss through the degradation and destruction of native vegetation elsewhere'.* (Seddon, 2022)

In relation to these risks, NbS should be designed for longevity, and more research and evidence is necessary for support of the best NbS design in specific ecological and social scenarios. As will be discussed below, robust safeguards are needed to ensure that NbS achieve multiple societal benefits and biodiversity net gain especially where mitigation is a primary objective. Following the IUCN Global Standard for NbS, NbS interventions seeking climate change mitigation outcomes shall enhance ecosystem integrity ensuring long-term resilience for nature and people, which is further ensured by the requirement that NbS result in biodiversity benefits.

BEYOND SAFEGUARDS: Assuring No Harm to People and Nature

In accordance with both the IUCN Global Standard for NbS and the UNEA Resolution 5/5 definition, NbS are designed to respect the most rigorous social and environmental safeguards, and furthermore, provide benefits to both people and nature. As mentioned previously, there is a risk that by focusing solely on climate change mitigation, some of the solutions may lead to a decrease in biodiversity. Such approaches are sometimes mislabelled NbS. For example, the use of forest plantation monocultures leads to less species richness and can increase exposure to hazards (e.g., wildfires, erosion), further exacerbating environmental impacts. Other societal challenges such as food or water insecurity may also become exacerbated, adding additional constraints on the communities that rely on the ecosystem. As stated by Portner et al. (2023), "biodiversity loss contributes to climate change through loss of wild species and biomass."

There is work to be done to better understand how to address and manage such trade-offs in NbS design, especially around issues of better reflecting the full range of values of affected communities and Indigenous Peoples and Local Communities (IPLCs). Many of the standard tools of practice for addressing climate change and biodiversity loss do not adequately incorporate multiple value systems in relation to nature (IPBES, 2022). Payments for ecosystem services are regularly promoted because they can generate financial return for affected communities. However, it is often the case that access to the land or seascape for non-financial reasons provides more significant value than any monetary return for a narrowly defined ecosystem service. Further, for some Indigenous Peoples, the formal rules of engagement within standard climate change and biodiversity actions can be inadequate if they are focused only on representation and do not adequately prioritize equitable project leadership and territorial and revenue rights (Townsend et al., 2020). There are concerns that projects falsely labelled as NbS might repeat historic patterns of displacement from conservation and development activities, either directly through enclosing lands or indirectly through unfair benefits sharing, such as the capture of carbon credit revenues generated by the project. It is in response to these concerns that efforts to develop definitions and verification frameworks have emerged.

Such concerns are given special attention in the IUCN Global Standard on Nature-based Solutions. Specifically, the need to address trade-offs and synergies, in an integrated manner, in both policy and practice (criterion 6). The Global Standard recognizes different types of inevitable trade-offs: ecological, economic, governance, spatial and temporal, and proposes actions to address them across all the criteria. More specifically, criteria 6 refers to the identification and management of trade-offs: "NbS equitably balances trade-offs between achievement of their primary goal(s) and the continued provision of multiple benefits" (IUCN, 2020). The rationale behind this criterion is that designing an NbS to maximize the highest number of benefits may reduce the overall impact for the prioritised societal challenge for which it was designed. The Global Standard also recognizes that not all stakeholders are equally affected and the NbS needs to be explicit about whose benefits and whose costs will be addressed. Some trade-offs result from deliberate decisions, while others occur without any planning or awareness of the impacts. Trade-offs can be successfully managed if the consequences are properly assessed, disclosed, and agreed upon by the most relevant stakeholders. Fair and transparent negotiation of trade-offs and compensation among those potentially affected is required.

Furthermore, for NbS to be lasting, effective and equitable, they need to be anchored in the legal system, both on the international, regional, national and local level. Law is a crucial governance tool for integrated NbS. Appropriate laws and regulations are needed for creating the fundamental, legal structures for a coordinated, fair and effective response commensurate with the global challenges of biodiversity loss and climate change. Not only international law but also legal responses and changes at all levels and in all sectors, and their effective implementation, compliance, and enforcement are needed. Legal structures need to be in place that protect and enhance the environment and recognize its profound value for other objectives, such as the enjoyment of human rights, economic and social development, equity, and stability, welfare, and security.

Legal responses to NbS need to be informed by best-available science, take a preventative and - where necessary - a precautionary approach, safeguard against regression from achieved levels of protection and ensure environmental and social benefits, such as the meaningful and representative participation by all relevant stake- and rights holders, in particular, Indigenous Peoples and affected local communities, access to information and access to justice.

FUNDING NEEDS AND FINANCING OPTIONS

The World Economic Forum (WEF) has projected that investment in NbS needs to at least triple by 2030 and increase fourfold by 2050 to meet climate change, biodiversity, and land degradation targets. This acceleration would need a cumulative total investment of up to USD 8.8 trillion and a future annual investment rate of USD 674 billion (UNEP, 2022). A significant challenge in financing the required NbS upscaling is that most of nature's benefits are so far not fully measured and financially factored in, even though nature underpins our survival, well-being, and prosperity. However, caution should be exercised in the face of the potential commodification of nature, as it involves not only economic considerations but also risks compromising the intrinsic ecological, cultural, and aesthetic values that ecosystems hold for present and future generations.

The State of Finance for Nature in the G20 report states that current G20 investments in NbS are insufficient, at USD 120 billion/year, and G20 Official Development Assistance and private sector investments are small when compared with domestic government spending, leading to a USD 4.1 trillion financing gap in NbS between 2020 and 2050 (UNEP, 2022). The report discloses that the vast majority of G20 investments, 87% or USD 105 billion, were distributed internally towards domestic government programs. Of public funds invested annually, over a third flowed to the protection of biodiversity and landscapes, compared to nearly two-thirds on forest restoration, peatland restoration, regenerative agriculture, water conservation and natural pollution of systems. While the private sector makes up 60 % of total national GDP in most G20 countries it contributes just 11 % of overall G20 NbS spending (USD 14 billion annually). This spans biodiversity offsets, sustainable supply chains, private equity impact investment and smaller amounts from philanthropic and private foundations (UNEP, 2022).

Future G20 domestic investment is needed (USD 165 billion total additional investment by 2050) to comprise 40% of total global NbS investment, considering only four principal NbS: forestry (USD 102 billion), silvopasture, mangrove restoration, and peatland restoration. The remaining 60% of annual future investment lies in developing countries where fiscal space to invest in NbS is limited (UNEP, 2022). In the same trend, the 2023 European Investment Bank report on Investing in nature-based solutions; state-of-play and the way forward for public and private financial measures in Europe presented key lessons learned and recommendations from a finance perspective to support the future uptake and scaling up of NbS in the European Union (EIB, 2023). Despite the deep interest in nature-based projects in the EU, private entities are still far from committing to large-scale capital deployment. Much of the capital allocated to NbS still comes from public sources of funding — a combination of grants or philanthropic sources and local or regional funding (EIB, 2023). These findings confirm the urgency for investments to close the biodiversity and climate finance gaps, as reflected in the Kunming-Montreal Global Biodiversity Framework's Target 19 under the UN Convention on Biological Diversity and the Glasgow Climate Pact of the UN Framework Convention on Climate Change. They also reinforce the need to accelerate ecosystem protection, conservation, and restoration around the globe, as declared by the UN Decade on Ecosystem Restoration 2021-2030.

There are actions that can facilitate the necessary increase in investment. This includes developing a global methodology and standardized approach to classify, measure, and value NbS in a way that allows cross-country comparison and analysis and is meaningful for investment decision-making (UNEP, 2022). Furthermore, international financial institutions such as multilateral development banks (MDBs) could adjust existing financing mechanisms to ensure portfolio-wide financial support is aligned with the Paris Agreement and the Kunming-Montreal Global Biodiversity Framework (GBF), and thus consistent with 1.5°C warming above pre-industrial levels and halting and reversing biodiversity loss (UNEP, 2022). Additional elements necessary to increase finance include a conducive legal and administrative framework and more robust economic incentives to invest in NbS. However, overcoming issues of measurement and liquidity alone will not solve the puzzle, with conducive legal and administrative frameworks as well as economic incentives to invest, being key areas to consider.

ANALYSIS

How to Accelerate NbS Impact Across the ENACT Work-streams

On 6 March 2023, ENACT Co-chairs and IUCN convened a workshop with ENACT Partners and other interested parties. The workshop sought to identify priority actions for the partnership in 2023. As a component of this, the categories of ENACT workstreams, which were originally conceived to meet context-specific demands of NbS implementation, were refined and agreed. The ENACT workstreams correspond to the High-Level Champions Sharm-el-Sheikh Adaptation Agenda (SAA) by aligning across systems. The nine ENACT Workstreams cover the following systems: Agriculture, Water, Green-Grey Infrastructure, Human Settlements, Oceans and Coastal, Health, Funding and Finance, Human Rights, and Decent Work.

This structure facilitates the aim of ENACT to build synergies and strengthen collective action for NbS to address the challenges of climate change, biodiversity loss, and land degradation. Workstream participants currently include representatives from: UN World Health Organization, Conservation International, ICLEI—Local Governments for Sustainability, UN-Habitat, UN Environmental Program, SwedBio, Forest Peoples Programme, International Labour Organization, and IUCN.

The analysis in this inaugural report focuses on three key areas. First, an overview of the state of knowledge in the system and the role of NbS in aligning action in that system with climate change and biodiversity agendas. Second, a discussion of the status of monitoring and measuring NbS aligned impact in these systems, including when applicable discussion of targets and indicators in use or development. Third, a presentation of key research needs to advance the application of NbS within that system. Finally, where applicable, the workstream sections conclude with case studies of good practices which have undergone the IUCN Global Standard Self-Assessment and are featured on the PANORAMA Platform.

AGRICULTURE SYSTEMS

KEY CONTRIBUTORS: IUCN

STATE OF KNOWLEDGE: The role of NbS in Agriculture Systems

The transformation of food and agriculture systems is essential to meet the goals of the UNFCCC, CBD, UNCCD, and SDGs. This includes adjustments to crop production, livestock, forestry, fisheries, and aquaculture as well as how these systems are managed in relation to nature (FAO, 2014). Agriculture accounts for roughly one third of Greenhouse Gas Emissions (GHG) (Fuentes-Ponce et al., 2022). Within a Paris Agreement-aligned pathway, emissions from agriculture need to reduce by 39% by 2050. Agricultural expansion is the primary driver of native habitat loss globally with related extinction rates of at least 10,000 species per year (Hallstein and Iseman, 2021). However, a focus on agricultural intensification can also result in ecosystem degradation and reduction in human well-being through reliance on synthetic fertilizers (Burney et al., 2010) and exacerbations to land concentration. Notably, 90% of global fisheries are fully fished or overfished, with aquaculture as the fastest growing source of supply in animal protein (Hallstein and Iseman, 2021), while 52% of agricultural land is severely or moderately degraded leading to the abandonment of 12-million hectares per year (Hallstein and Iseman, 2021).

NbS can provide the framework for shifting productive landscapes from drivers of climate change, biodiversity loss, and land degradation to a source of solutions. When combined with forestry, agriculture is one of the only sectors that can become a carbon sink (IEA, 2022). The use of NbS can build the resilience of agricultural landscapes against weather extremes through practices that enhance soil health and water retention to buttress against droughts, reduce soil erosion in the context of heavy storms, and buffer shorelines to reduce negative impact from coastal flooding. The use of NbS in agriculture can also reduce carbon emissions from the food sector and improve its carbon sequestration potential through practices such as crop residue mulching, cover cropping, and reduced tillage to enhance the carbon storage capacity of plants and soils (Griscom et al., 2017). The selection and design of NbS in agriculture is best aimed at reducing the negative trade-offs between maintaining production and ensuring food security whilst concurrently attaining climate, biodiversity, and land use objectives.

The Food and Agriculture Organization (FAO) of the UN and The Nature Conservancy's (TNC) joint publication, Nature-based solutions in agriculture: Sustainable management and conservation of land, water and biodiversity (2021) reviews the range of NbS that may be applied in agricultural landscapes. Many of these practices are aligned with either regenerative agriculture or agroecology (Wyenberg et al, 2023). In this way, there is potential to advance NbS in agriculture systems to build links with this work. To do so effectively, NbS proponents should adopt the perspectives of these fields in emphasizing the need to support investment and actions toward food system transformations that encourage diversified agroecosystems, respect human rights, and the rights and concerns of Indigenous Peoples and small-scale producers.

TOWARD TARGETS AND INDICATORS: How to value and evaluate the integration of NbS and Agriculture Systems

The full potential of NbS in agriculture to address climate change, biodiversity loss, and land degradation has not been achieved. A primary limitation is the capital requirements of NbS for agriculture, specifically, the relatively high initial investment necessary to establish an NbS in any given agriculture system and the time gap on return. While there is a need for financial mechanisms to shift for this to be fully overcome, there are dynamics internal to NbS and agriculture systems that can be developed to remedy this gap. In part, improved frameworks for evaluation of NbS in agriculture could reduce uncertainty around investment.

A recent systematic review sought to address this need by developing a normative framework for NbS-practices in agriculture, bridging the conventional divide between production and conservation and exemplifying the specific problems for which NbS offer solutions (Simelton et al., 2021). The framework is developed from a review of 188 peer-reviewed articles on NbS and green infrastructure published between 2015 and 2019 as well as 3 expert consultations. The framework establishes four essential functions for NbS in agriculture: 1) Sustainable practices — with a focus on production; 2) Green Infrastructure — mainly for engineering purposes such as water and soil, and slope stabilization; 3) Amelioration — for restoration of conditions for plants, water, soil or air, and climate change mitigation; and 4) Conservation — focusing on biodiversity and ecosystem connectivity.

For any framework evaluating NbS in agriculture systems to function it must account for succession as a component of design. The appropriate approach will depend on a range of factors based on the context of the agriculture system, specifically, efforts should seek to enhance development of NbS for specific ranges of ecozones and socioecological contexts to support a breadth of small-scale cases than can be linked through supported processes of exchange and adaptive learning. Such an approach would further support the evidence base necessary to grow NbS in agriculture systems. Further, effective integration of NbS in agriculture systems demands support from a wide range of actors with often conflicting objectives (farmers, communities and resource managers, local government extension workers and advisors at farm and landscapes scales, downstream value chain actors at local and global levels, and national policy makers). Adequate frameworks will be essential for translating benefits across the range of actors involved and for clearly analysing trade-offs and prioritizing actions and investments.

RESEARCH NEEDS: Key knowledge gaps in the integration of NbS and Agriculture Systems

Economic benefits for food producers: Limited analysis exists for the full range of benefits NbS can provide to food producers. Existing research is largely focused on small case studies or exclusive to mitigation benefits. Expanded research on the full extent of adaptation and conservation benefits, synthesized at a global scale, could enhance investment and support for NbS in agricultural systems.

Mitigation potential: Although there is significant potential for mitigation benefits from NbS in agricultural systems, there is limited investment in these solutions. This is largely due to uncertainty about the permanence of natural carbon storage and the social and political barriers to implementation. More research is necessary on these components in relation to such practices as reforestation, avoided forest conversion and conservation and restoration of wetlands and peatlands. This work should integrate analysis of effects on food production.

Overall benefits: More research is needed for a full benefit analysis of NbS and agriculture systems, including focused work on the social and ecological effectiveness of NbS and agriculture by specific practice type. This should include methods to quantify ecosystem services in agriculture landscapes which include analysis of implementation pathways that account for socially and culturally responsible means to increase resilience and improve food security.

Floating rice field in Long An Province © IUCN Viet Nam

GOOD PRACTICE CASE STUDY

PANORAMA PROJECT

AGROFORESTRY SYSTEMS FOR SUSTAINABLE COCOA FARMING IN THE LACHUÁ ECOREGION

LEARN MORE

LOCATION

Lachuá Ecoregion, Municipalities of Ixcán, Quiché and Chisec, Guatemala

BENEFICIERIES

Q'eqchi' Maya ethnic group, 898 producers and technicians

CHALLENGE

Mono-cropping of cardamom, low quality cocoa, and maize in Guatemala are common, but are often cultivated in a way that leads to land degradation, loss of soil health, and negative impacts on biodiversity. Such monocultures are also associated with increased social inequality and poverty. In the case of the Lachuá Ecoregion, local government and community members sought to address these linked social and environmental challenges through cocoa agroforestry. The practice was identified through a participatory assessment of livelihood options and chosen because of its cultural value for Q'eqchi' Mayans.

APPROACH

As a native species typical of the region and high in yields and quality, cocoa had high potential to advance the economic and social development of producers and communities, particularly women and youth of the Q'eqchi' ethnic group. The innovative cocoa agroforestry model agreed with local communities focuses on high quality trees, good agricultural practices (shade, pruning, harvesting, fertilization, new planting densities), and good processing, fermentation, and drying practices.

5671698 from Pixabay

ANALYSIS

INTEGRATED IMPACT: ADAPTATION, BIODIVERSITY, MITIGATION

The main positive impacts of the introduction of agroforestry systems for sustainable cocoa farming include the improvement of ecosystem services in previously degraded areas. This had particular significance in the buffer zones of the Laguna Lachuá National Park and a Ramsar site.

Through the Nature-based Solution intervention, 303 hectares of monocrop areas were changed to cocoa agroforestry systems in areas of high value for conservation. Changes of land-use to agroforestry systems contributed to greenhouse gas emissions reductions of 9,320 tonnes of CO_2e (1,864 tonnes of CO_2e per year; 80 per cent increase in CO_2e storage in terrestrial biomass, such as trees and roots, and 20 per cent in soils), erosion reduction between 33.8 and 107.7 tonnes per ha depending on land-use prior to cocoa agroforestry systems and sedimentation reduction between 0.03 to 4.6 tonnes per ha depending on land-use prior to cocoa agroforestry systems.

KEY SUCCESSES

Robust business model considering the full value chain: While the NbS intervention focused on changing land-uses towards good agricultural and manufacturing practices for cocoa agroforestry systems in the Lachuá Ecoregion, the project placed emphasis on developing strategies that cover the full cocoa value chain.

Long-term engagement and local knowledge to maximize biodiversity impact: A good understanding of the environmental, social, and economic challenges was ensured through over 20 years of work in the region. This was supplemented with a set of assessments using the Restoration Opportunities Assessment Methodology (ROAM) and the InVEST tool to provide evidence of direct and co-benefits.

Ensuring social inclusion and involvement of indigenous women and youth: Throughout the project, consultations and participatory approaches and free, prior and informed consent (FPIC) were applied. Local community associations were created and strengthened in close coordination with formal organizational structures (community councils for development).

KEY PUBLICATIONS AND RESOURCES

- Iseman, T. and Miralles-Wilhelm, F. 2021. Nature-based solutions in agriculture – The case and pathway for adoption. Virginia. FAO and The Nature Conservancy.
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- Hallstein, E., and Iseman, T. 2021. Nature-based solutions in agriculture – Project design for securing investment. Virginia. FAO and The Nature Conservancy.

WATER SYSTEMS

KEY CONTRIBUTORS: IUCN WATER TEAM

STATE OF KNOWLEDGE: The role of NbS in Water Systems

Climate change and water are inextricably linked. Extreme weather events, the occurrence and severity of which is enhanced by climate change and are exacerbating water unpredictability and scarcity as well as water pollution (UN Water, 2020). The disruption of precipitation patterns and the water cycle due to rising temperatures is compounding issues related to both water scarcity and water-related risks, including droughts and floods (UNICEF, 2023).

Water scarcity is a major global challenge, affecting billions of people (Sachs et al., 2023). Climate change and population growth are enhancing the problem, by reducing freshwater supply and increasing water pollution, respectively (Bates et al., 2008; WMO, 2022a). The UN's SDG 6 Water and Sanitation Blueprint indicates that 20% of the world's river basins have experienced rapid changes, a circumstance indicative of flooding and droughts often linked to climate change (UN, 2023). Efforts to limit global warming to 1.5°C would help, but the combined effects of climate change, population growth, and water scarcity will place significant pressure on food supplies (FAO, 2017; Jiménez Cisneros et al., 2014). In addition, climate change is amplifying the frequency and severity of water-related hazards (IPCC, 2022). Water-related disasters have constituted 70% of natural disaster-related deaths over the past half-century (World Bank, 2022), with flood-related disasters surging in Asia while droughts affect Africa (WMO, 2021). These challenges threaten sustainable development, biodiversity, and access to clean water and sanitation. They can also lead to civil unrest, migration, and food insecurity (UN Water, 2020).

NbS have the potential to improve water quality and quantity under climate change. Palermo et al. (2023) highlights that nature-based solutions, such as green roofs, rain gardens, and permeable pavements, can reduce surface runoff and restore the hydrological cycle in urban areas. Boelee et al. (2017), identifies NbS as a potential approach to address water challenges in various areas, including cities, food production, hydropower, and flood protection. de Freitas et al. (2022) finds that focusing on key areas for water recharge and applying forest restoration, specifically watershed and riparian vegetation, can increase water supply resilience, particularly when combined.

UN Water (2018) emphasizes the importance of nature-based solutions in achieving water management objectives, as they provide cost-effective and sustainable benefits for the environment, society, and economy. Key sustainable water solutions include:

a. protecting and restoring natural buffers like coastal mangroves, seagrasses, salt marshes, and inter-tidal flats (these ecosystems not only act as potent carbon sinks, but also function as natural buffers against extreme weather events, offering protection against storm surges, water absorption, and purification through their plant and microorganism populations) (UN Water, 2020);
b. adopting climate-resilient water supply and sanitation systems, such as rainwater harvesting and reusing wastewater (UN Water, 2020) (According to the New Climate Economy Report (2018), this can save the lives of over 360,000 infants annually);
c. responsibly managing groundwater to adapt to climate change and support growing populations (UN Water, 2020).

TOWARD TARGETS AND INDICATORS: How to value and evaluate the integration of NbS and Water Systems

Sustainable water management enhances resilience, safeguards health, and mitigates climate change by reducing greenhouse gas emissions associated with water and sanitation. However, valuing and evaluating the impact of NbS in water systems is complicated by both issues of ecology and governance, among other things. Cross-border cooperation is essential to balance water requirements for communities, industry, agriculture, and ecosystems (UN Water, 2023). Nature-based solutions (NBS), such as restoring forests, protecting mangroves, and building green/blue infrastructure, offer sustainable ways to enhance water security, counter climate risks, and boost biodiversity.

Robust hydrological monitoring systems will be required, to ensure that an NbS is resulting in the desired outcomes for a water system. This involves measuring parameters such as flow rates, water levels, sediment transport, and water chemistry. In addition, it is essential that NbS be designed to monitor ecological indicators related to water, such as wetland extent, riparian vegetation health, and aquatic biodiversity, offers insights into ecosystem functioning. An additional means to evaluate NbS for water systems involves water budgeting, which involves assessing inputs, outputs, and storage dynamics. This includes evaluating precipitation patterns, evapotranspiration rates, groundwater recharge, and surface runoff. Understanding water balances enables better management of water resources and informs decision-making processes.

Given the demands of effective monitoring, good financing is a significant need (UN Water, 2023). In addition, investing in early warning systems for floods, droughts, and water-related hazards, yields substantial returns, reducing disaster risks significantly (WMO, 2022b). Such systems, which work at the level of risk prevention through preparedness greatly increase the effectiveness of NbS, which is an integrated approach. While the awareness and interest in NbS grow, challenges like equitable implementation and scaling remain, underscoring the complexity of the climate-water nexus and the potential of NbS in addressing its challenges.

Top view of building with trees © CHUTTERSNAP - unsplash

RESEARCH NEEDS: Key knowledge gaps in the integration of NbS and Water Systems

There is a substantial knowledge gap when it comes to designing, implementing, and monitoring NbS for water management in the context of climate change. Overall, there is a need for innovative approaches, interdisciplinary research, and improved data and modelling techniques to address the research needs in understanding NbS for water under climate change.

Modelling capabilities for diverse contexts: There is need for greater insight on NbS effectiveness across diverse contexts, where factors like local climate, hydrology, and land use significantly influence outcomes. Wamaars and Harding (2010) emphasize the importance of an integrated approach and improved modelling capabilities to understand the global water cycle's response to climate change.

Synergy assessments: The synergies and potential trade-offs associated with NbS need to be comprehensively assessed, acknowledging their broader impact on biodiversity, carbon sequestration, and food security, while carefully considering competition for land and water resources. While this is a challenge for all systems in relation to NbS, there are specific governance concerns for water, as well as livelihood concerns that exceed those in some other systems.

Integrated analysis of water-impact across NbS: Specific NbS types, such as green roofs, wetland conservation/restoration and forest restoration, demand tailored research to understand their effectiveness in addressing various water challenges. Addressing these research needs is essential for a sustainable and equitable approach to tackling water challenges under climate change using NbS.

JAY PARK from Pixabay

GOOD PRACTICE CASE STUDY

PANORAMA PROJECT

MARISTANIS: AN INTEGRATED COASTAL AND WETLANDS MANAGEMENT

LEARN MORE

LOCATION

Oristano, Italy

BENEFICIERIES

Fisheries and farming associations, territorial authorities, local companies, fishermen, farmers, tourism operators

CHALLENGE

The coastal area of the Gulf of Oristano includes six Ramsar sites, 19 Natura 2000 sites in 11 municipalities and one Marine Protected Area across approximately 7,700 ha along 140 km of coastline. The presence of 11 Municipalities creates a challenging context for wetlands management resulting in overexploitation and ecosystem degradation. The project objectives focused on developing a single governance model that could balance the demands of the range of economic activities (artisanal fishing, agriculture, and tourism) alongside maintaining ecosystem integrity.

APPROACH

The proposed intervention was part of a larger project, Maristanis, funded by the Mava Foundation and coordinated by the MEDSEA Foundation. Maristanis developed activities regarding governance, water quality and saving, restoration (sea and land-based) and agriculture and fishing involvement. In the governance framework, the project focused on creating an integrated management model offering a long-term management strategy for

Mida Creek, Kenya © Timothy K - unsplash

ANALYSIS

the coastal wetlands found in the Gulf of Oristano – a new regional park. It contributed to balancing social and environmental needs and paved the way to recognize the economic and cultural potential of the wetlands.

INTEGRATED IMPACT: ADAPTATION, BIODIVERSITY, MITIGATION

The governance model strengthens the conservation of coastal and marine habitats, reinforces resilience to climate change impacts and reduces water consumption, abstraction, pollution and contamination. The area that has benefited from the restoration measures developed in the project is estimated at about 600 ha. The new island for bird nesting has a surface of 110 square meters, a building with 143 cubic meters of mussels inside to 1100 jute sacks. Precision agriculture measures were tested on more than 200 hectares, mainly with drones on maize and rice cultivation. Sub-irrigation technologies were tested on 9 hectares cultivated with (organic) artichokes and strawberries, and surface micro-irrigation on three carrot hectares. A precision agriculture project with satellites on 5000 hectares, mainly used to cultivate maize for feeding cattle, was developed.

KEY SUCCESSES

Stakeholder engagement: More than 400 stakeholders were involved in the activities directly or indirectly, particularly from the agriculture, fisheries and tourism sectors. An important awareness-raising action was developed with the schools on World Wetlands Day and Coast Day, with clean-up, training events, competitions and the creation of an educational kit.

Integrated governance and- legal foundation: The adoption of the Oristano Coastal Wetlands Contract (CWC) by the 11 municipalities provided an important legal basis and framework to advance the integrated management of six wetlands in the Gulf of Oristano. An integrated and unique system of governance was needed in a framework characterized by fragmented wetland management (between regional and local government) and similar problems and ecosystem shared in all wetlands.

HUMAN SETTLEMENT SYSTEMS

KEY CONTRIBUTORS: IUCN URBAN TEAM, UN-HABITAT, ICLEI

STATE OF KNOWLEDGE: The role of NbS in Human Settlement Systems

NbS in human settlements play a crucial role in contributing to the health and wellbeing of people as well as providing resources and habitat for other biota. The expected effects of climate change on human settlements, including increases in temperature and the creating of heat islands, exposure to sea level rise and more frequent and intense weather events (including storms, floods, and droughts), and an increase in water- and vector-borne contagious diseases, will have negative impacts on people and the security of infrastructure (Dodman et al., 2022).

NbS have the potential to help with adaptation to these climate threats. Examples include the shading and evaporative cooling effects provided by vegetation that help to ease the temperatures experienced in heatwaves and reduce the heat island effect (Bowler et al., 2010), the absorption and attenuation of water by vegetation from storm surges and floods, or dilution of disease vectors through the provision of natural habitats. Coastal cities are particularly vulnerable to climate effects such as sea-level rise, storm surges and flooding, and NbS can serve to help moderate some of the impacts.

Cities, through their expanding development footprints and urban residents' consumption patterns, are significant contributors to greenhouse gas (GHG) emissions and climate change. These effects are varied throughout the city, depending on different land use patterns and levels of resource use by different populations. Deploying NbS in cities can help to reduce GHG emissions through carbon sequestration by vegetation (IPCC, 2022), and reduction of land use that are significant contributors to emissions, such as industry.

Urbanization and urban development can have negative effects on biodiversity, through destruction of habitat and reduction of habitat quality and connectivity when natural areas are replaced by the built environment (IPBES, 2019; Müller et al., 2013). The introduction of pollution can also have negative effects on biodiversity (ibid). NbS have the potential to reduce these effects by providing habitat for species, thus allowing their numbers to increase. Through intentional design, NbS can increase species diversity in cities, though care must be directed to promoting native species and avoiding the introduction of alien invasive species.

Generating greater urban resilience through implementation of NbS can have a positive effect on human health—for instance, increasing vegetation can help to improve urban air quality. However, these NbS must be designed with social and biodiversity considerations in mind. NbS must meet social acceptability and palatability through co-design of provision for desired cultural ecosystem services of urban residents. Further, NbS must meet biodiversity expectations through ensuring incorporation of a diversity of species.

The application of NbS to urban and infrastructure resilience is distinct from other framings of sustainable cities and green building (including green infrastructure and biomorphic design) in that NbS are not merely actions to protect, conserve, and sustainably use and manage ecosystems, but they also contain a strong social component to address social, economic, and environmental challenges, while also providing human well-being, ecosystem services, resilience, and biodiversity benefits.

TOWARD TARGETS AND INDICATORS: How to value and evaluate the integration of NbS and Human Settlement Systems

A vast array of solutions exists to help address local and global impacts of cities on nature. However, the challenges posed by the limited understanding of their financial benefits as well as lack of documentation of context specific impacts of urban NbS, means these are often not deployed. On a financial level, a study on Assessing the Benefits and Costs of Nature-based Solutions for Climate Resilience, carried out by the World Bank, provides case studies of NbS developed in different ecosystem typologies, including urban. Similarly, the UNEP has published a stock take on the State of Finance for Nature in Cities, which sheds light on the opportunities to scale up investments for nature in urban ecosystems. NetworkNature has released a fact sheet on financing NbS in cities presenting cost-effectiveness case studies comparing nature-based and grey approaches in cities in terms of labour time for management, reduced social and environmental risks, and human well-being. Another important aspect to consider while evaluating NbS over conventional urban interventions concerns avoided losses and saved costs, for instance in relation to citizen health or disaster risk reduction.

The documentation of benefits related to the application of NbS in cities has proved challenging in terms of the identification of direct and indirect positive impacts. In the context of the European Union, the European Commission has produced a handbook outlining a set of indicators and methodologies assessing NbS mainly in urban ecosystems, drawing from the experience of EU-funded projects. The resource addresses urban practitioners and orients them in developing science-based monitoring and evaluation frameworks for NbS impacts. Some of the suggested indicators to evaluate NbS performance and impacts are related to societal challenges addressed, climate resilience, health and wellbeing, social justice and cohesion, air quality, and creation of green jobs. The latter constitutes an important metric to assess the long-term benefits of NbS. By involving local communities in the planning, implementation, monitoring and maintenance of NbS projects through participatory methods, municipalities can create opportunities for green jobs and economic development.

Green building © Ricardo Gomez Angel - unsplash.com

At a global level, amongst the different frameworks measuring the status of nature in cities, the Singapore Index is considered the most comprehensive index on cities' biodiversity, developed in the framework of the Convention on Biological Diversity. An additional tool employed to monitor cities' ecological performances and impacts on nature is the IUCN Urban Nature Indexes (UNI). The advantage of this methodology is its flexibility – municipalities can select the most appropriate indicators based on local resources, needs and allocated staff – as well as the different calculation methods that can be selected to fulfil each indicator. Accordingly, municipalities from high-income and low-income countries alike can assess the UNI based on their capacities. Furthermore, the methodology provides opportunities to empower residents through citizen science, monitor access to green spaces for underserved communities, and address equity and justice. The application of frameworks such as the Singapore Index and the UNI allows municipalities to be part of communities of practice encouraging knowledge sharing between city representatives and urban practitioners around the globe. The establishment of baselines before the implementation of NbS, and the monitoring of trends over time through these indices can successfully measure the positive impacts derived from ecosystem-based approaches.

Finally, several EU-funded projects have produced resources and guidelines on NbS co-design approaches and participatory processes for urban ecosystem restoration, and increasing visibility is being given to Indigenous peoples living in urban environments, as well as upholding environmental rights in cities. Establishing co-design processes would help municipalities address the plurality of views on how nature in cities is perceived and benefitted from

RESEARCH NEEDS: Key knowledge gaps in the integration of NbS and Human Settlement Systems

Quantifying benefits to social and qualitative factors: Research on NbS should focus on quantifying and better understanding the underlying mechanisms related to the direct and indirect health, social and qualitative benefits of these interventions. This includes examining how green spaces, urban parks, and natural elements in cities contribute to physical and mental well-being, reduced stress, improved air quality, and overall public health.

Improved maintenance practices: Research is needed on ways in which communities can be empowered to lead on and own NbS for wide scale public participation and long-term support and sustainability of projects. This could be improved by understanding how NbS can be mainstreamed in different local contexts through co-design and foregrounding Indigenous Peoples' perspectives.

Creation of public incentives to support NbS for urban and infrastructure resilience: More research is needed to identify and optimize public incentives and policy frameworks that support the effective implementation of NbS for urban and infrastructure resilience. To bridge this knowledge gap, it is crucial to conduct studies that explore context-specific incentives, including tax mechanisms, financial assistance programs, and performance-based incentives.

Developing new models of spatial design and land use planning: Research should prioritize examining policy frameworks for their alignment with NbS objectives and addressing regulatory barriers. There is a need to explore how NbS can be integrated into urban planning and design to enhance social benefits, including creating functional green spaces that encourage physical activity and a sense of belonging within cities.

GOOD PRACTICE CASE STUDY

PROJECT

ENHANCING CLIMATE ADAPTATION IN THE NORTH COAST AND NILE DELTA, EGYPT

LEARN MORE

LOCATION

Kafr El-Sheikh, Port Said, Damietta, Beheira, Dakahlia

BENEFICIERIES

The coastal protection measures will directly benefit approximately 768,164 people and indirectly benefit 16.9 million people in urban and rural communities.

CHALLENGE

The expected sea-level rise from unabated climate change will directly impact the infrastructure of Egypt's low lying coastal lands. These impacts threaten Egypt's population and development prospective. The Nile Delta of Egypt's northern coast is the country's primary agricultural land. The saline intrusion resulting from storm surges and sea level rise will weaken Egypt's entire economy. These effects are already being felt, as economic losses from extreme weather events have increased consistently over the past 10 years. Effects have included major floods with devastating impacts on infrastructure and livelihoods in both rural and urban regions. Without efforts to adapt, Egypt's potential and timely achievement of the sustainable development goals is greatly compromised.

APPROACH

The "Enhancing Climate Change Adaptation in the North Coast of Egypt" project aims to protect the densely populated low-lying lands in the Nile Delta, the home of 25 percent of the Egyptian population, which have been identified as highly vulnerable to climate change

Video - Using the power of nature to fight climate change in Egypt © Green Climate Fund

ANALYSIS

induced sea-level rise. The project is implemented by the Ministry of Water Resources and Irrigation with a total budget of USD 31.4 million from Green Climate Fund (GCF) through UNDP as Accredited Agency, over seven years in addition to co-finance from Government of Egypt. The project is coordinated by the Ministry of Environment.

The project will provide flood protection in the low-lying lands through the construction of low-cost dikes which buffer against sea surges during coastal weather events. The dyke system used has been extensively tested through previous Global Environmental Facility (GEF) projects and makes use of a reed fence placed on the top of the dike in order to collect windblown sand and enhance the dyke into a natural dune.

INTEGRATED IMPACT: ADAPTATION, BIODIVERSITY, MITIGATION

In addition to providing the flood mitigation benefits, the project also supports the development of an Integrated Coastal Zone Management Plan (ICZM) for Egypt's North Coast. The plan is developed and coordinated with the Ministry of the Environment, and led by a ICZM National Focal Point. This integration ensures that the plan is directly aligned with the national development plan for coastal zones and is further supported through the establishment of a systematic observation system. This system will enhance the infrastructural flood mitigation through Oceanographic parameters monitoring, to evaluate different scenarios from climate change alongside various shore protection efforts to reduce coastal erosion and provide stability.

OCEAN AND COASTAL SYSTEMS

KEY CONTRIBUTORS: IUCN OCEANS TEAM

STATE OF KNOWLEDGE: The role of NbS in Water Systems

The oceans perform a critical role in securing a liveable climate system while providing multiple co-benefits to communities and ecosystems. For example, services provided by mangrove habitats to human livelihoods are estimated to be worth at least USD 1.6 billion annually. While contributing to climate change mitigation and adaptation, coastal and marine NbS also have the potential to contribute significantly to a suite of Sustainable Development Goals (SDGs), including SDG 14 to "sustainably manage and protect marine and coastal ecosystems," as well as other global goals (e.g., food security, clean energy, clean water, decent work and climate change) (Pörtner et al., 2021).

NbS in coastal and marine ecosystems (coastal and marine NbS) are actions to protect, sustainably manage and restore coastal and marine ecosystems in ways that address societal challenges effectively and adaptively (Lecerf et al., 2023). Coastal and marine NbS for adaptation have the potential to protect vulnerable coastal communities and ecosystems from the impacts of climate change (i.e., extreme weather events, coastal erosion, sea-level rise), increasing their resilience and providing key ecosystem services to local populations. For example, coral reefs significantly reduce wave heights during coastal storms and tsunamis by reducing wave energy by an average of 97 % while providing a range of adaptation measures, helping communities to better cope with climate disasters (Ferrario, F. et al. 2014). In conjunction, the application of area-based management tools, such as marine spatial planning, marine protected areas (MPAs), and other effective conservation measures (OECMs) are vital to support the protection and restoration of marine and coastal ecosystems. Utilizing these tools alongside adaptive management approaches, such as climate-ready fisheries, can further improve ocean health and bolster the resilience of the aquatic food sector to the impacts of climate change (FAO, 2021).

Ocean and coastal ecosystems provide a range of GHG mitigation benefits, particularly in regard to reducing atmospheric CO_2 concentrations (Friedlingstein et al., 2023). Moreover, maintaining healthy ocean and coastal ecosystems offers protection from the threats of rising atmospheric CO_2 levels (e.g., ocean warming, acidification, deoxygenation, sea-level rise, etc.) (IPCC, 2019). Intact 'blue carbon' ecosystems (i.e., mangroves, salt marshes, seagrasses, kelp forests, peatlands, and soft-bottom habitats) provide numerous mitigation benefits as they possess high CO_2 sequestration and storage capacity. Furthermore, despite covering only 2% of the total ocean area, blue-carbon coastal ecosystems account for approximately 50% of the total carbon sequestered in ocean sediments (The Blue Carbon Initiative, 2021).

Coastal and marine NbS should not be used as a substitute for rapid, deep and sustained greenhouse gas (GHG) emission reductions in other sectors but rather as actions that must work alongside them. Furthermore, the GHG mitigation benefits provided by ocean and coastal ecosystems are directly linked in a feedback loop with overall climate impacts – the biophysical effects on oceans caused by climate change can reduce the climate-regulatory capacity of oceans among having other global and local ecological effects. For instance, warmer oceans are projected to perform a weaker carbon-uptake role as they retain less dissolved CO_2 due partially to a decline in biological productivity. The prevention of such impacts through safeguarding the health of ocean and coastal ecosystems is paramount to avoid positive feedback on anthropogenic warming.

TOWARD TARGETS AND INDICATORS: How to value and evaluate the integration of NbS and Ocean and Coastal Systems

The need to align NbS in ocean and coastal ecosystems with related environmental policy and targets is vital to ensure their effectiveness. This alignment is crucial to address pressing environmental concerns and achieve sustainable development. Effective methods for achieving this alignment include integrating NbS objectives into existing policy frameworks to bolster policy cohesiveness and collaborating with relevant stakeholders - particularly ensuring the co-design and implementation of interventions with Indigenous Peoples and Local Communities (IPLCs). Furthermore, understanding the impact of NbS on ecosystem services at various scales, ranging from sea basins to local contexts, is imperative. This evaluation must be linked to relevant policy targets to drive informed decision-making. To accomplish this, robust assessment methodologies which capture the full spectrum of ecosystem services and their spatial distribution are required.

While designing NbS in ocean and coastal systems, it is essential to acknowledge and evaluate trade-offs to make informed choices. This process requires the utilization of methodologies that weigh the benefits and drawbacks of different NbS options and the understanding that a uniform approach does not suit all situations. In conjunction, interventions chosen must adhere to the principles of NbS, and minimizing harm should be a central consideration throughout the decision-making process. Additionally, the longevity and resilience of NbS in ocean and coastal systems are imperative. Therefore, it is crucial to incorporate long-term impact assessments into management and design strategies. These assessments must also account adequately for climate risk, given the heightened vulnerability of ocean and coastal environments to climate change impacts.

RESEARCH NEEDS: Key knowledge gaps in the integration of NbS and Ocean and Coastal Systems

NbS identification and selection: Enhanced understanding and obtainability of optimal tools for selecting possible NbS in ocean and coastal systems. Including the adoption of a selection process which accounts for alignment with existing marine policy in addition to broader environmental, social, and economic factors. Of particular concern is the use of the ocean as a next frontier for mitigation through carbon dioxide removal (CDR) and storage. The potential risks to oceanic ecosystems are not well understood and the management systems to govern such activities are yet to be established. The inter connectivity among the different ocean systems means that those potential consequences could be far reaching.

Governance and engagement: Specific engagement and governance challenges of ocean and coastal ecosystems in relation to selecting, implementing, and monitoring ocean and coastal NbS must be addressed. For example, expansion of knowledge on ocean and coastal system-specific risk management practices is essential. Governance of these ecosystems is complicated further by the high rate of customary rights and informal usufruct rights that guide coastal access and use, as well as the challenge of transboundary governance.

Financing: Greater illumination of and action on funding and financing needs and challenges of NbS in ocean and coastal systems is crucial. Further dissemination of good/best approaches and establishing priority questions to guide research must support efforts in this space. The importance of addressing this need is emphasized by the significant scarcity of funding for ocean and coastal initiatives - exemplified by SDG 14 (life below water) being the most underinvested SDG.

GOOD PRACTICE CASE STUDY

PANORAMA PROJECT

SEAWEED FARMING IN ZANZIBAR: ADDRESSING THE COMMON CHALLENGE OF AQUACULTURE AND MARINE CONSERVATION

LEARN MORE

LOCATION

North Pemba, Tanzania

BENEFICIERIES

Seaweed farmers (88% are women), coastal communities, rural women fishers, tourism sector

CHALLENGE

Seaweed farming provides cash income for many women of local communities in Zanzibar. Seaweed farmers, 80% of whom are women, face several environmental, social and economic challenges. These include climate change, weak representation of women producers, difficulties in accessing international markets and insufficient protection of coastal ecosystems. Seaweed farming activities are usually small-scale and carried out in the intertidal zones largely in marine conservation areas, near mangroves and coral reefs. In response, an integrated coastal management approach and blue economy strategy were applied in Zanzibar.

APPROACH

Usually, seaweed harvested in Zanzibar is dried and exported to various parts of the world which used seaweed for pharmaceutical products and in the cosmetics industry. The approach taken focused on protecting coastal ecosystems and habitats, enhance artisanal

Women harvest seaweed for soap, cosmetics and medicine, Zanzibar, Tanzania © Shutterstock

ANALYSIS

fisheries and mariculture by facilitating alternative and diversified livelihood strategies for the seaweed farmers. The participating women were assisted in producing artisanal soap made of seaweed that they sell on local markets and direct sales into resorts to tourists visiting the archipelago.

INTEGRATED IMPACT: ADAPTATION, BIODIVERSITY, MITIGATION

During the implementation of the intervention, the project team conducted the self-assessment that helps determine whether an intervention is in adherence with the IUCN Global Standard for Nature-based Solutions™. The assessment provided information about the intervention's strengths and weaknesses and helped derive concrete recommendations and corrective actions for future interventions. Two criteria were deemed insufficient. Criterion 3 (biodiversity net-gain) fell short, because the analysis of the biodiversity benefits achieved through this intervention were largely based on a desk review of existing literature and information rather than a specific assessment, monitoring framework or thorough and collective effort with key informants and stakeholders. Criterion 6 (balancing of trade-offs) was also deemed insufficiently addressed. While there was a reported willingness from the Revolutionary Government of Zanzibar to consider relevant trade-offs, the limits of these trade-offs and associated safeguards were not clarified. In addition, while provisions on the rights, usage of and access to marine and coastal resources for mariculture are in place, further information on how this is applied in practice is required.

Several rounds of discussions revealed that the criteria were sometimes understood and interpreted differently by different people, impacting the assigned rating.

KEY SUCCESSES

Co-management approaches and women's empowerment: Co-management approaches were applied in marine conservation areas. These involved the government, local communities, seaweed farmers, NGOs and associations, often with international support. A particular feature was the inclusion, empowerment and support of women, considering their role as primary seaweed farmers and beneficiaries.

Taking corrective action: Several rounds of discussions, guided by IUCN expert reviewers, were held on the rationale and means of verification provided per indicator. Continued engagement. A new agenda of research and development work has emerged, including dialogues around NbS criteria and indicators with stakeholders in Zanzibar and local communities. The intent is that this will contribute to a future roadmap for Zanzibar and a framework for regular self-evaluation.

GREEN-GREY INFRASTRUCTURE SYSTEMS

KEY CONTRIBUTORS: CONSERVATION INTERNATIONAL, GREEN-GREY COMMUNITY OF PRACTICE

STATE OF KNOWLEDGE: The role of NbS in Green-Grey Infrastructure

Conventional engineering approaches for Disaster Risk Reduction (DRR) are costly and carbon intensive. Approximately USD 94 trillion in global infrastructure investment is needed by 2040 (Oxford Economics, 2017). Much of this will be required in low and middle-income countries, where the infrastructure gap is largest. Asia will require more than 50% of this investment (30% of the total for China alone), followed by the Americas (22%). Conversely, green-grey infrastructure (GGI) provides a cost-effective approach. Nature-based Infrastructure (NBI) projects can be up to 50% cheaper than traditional (grey) infrastructure and provide 28% better value for money. Replacing just 11% of current global infrastructure needs with NBI could save USD 248 billion each year (Bassi et al., 2021). Reducing the scale and scope of grey infrastructure by incorporating natural and nature-based features (NNBFs) and GGI are climate adaptation strategies that can also reduce or sequester carbon emissions (i.e., natural climate solutions). It is projected that approximately 70% of the increase in future greenhouse gas (GHG) emissions will come from future infrastructure. This, coupled with the expected increase in climate extremes, future infrastructure development must work to reduce its GHG footprint and increase resilience to impacts (PwC, 2020).

GGI projects that combine NNBFs with traditional engineering approaches have been implemented successfully for decades in the United States and other high-income countries. Many of these GGI projects have focused on flood risk management through large-scale civil works like constructing levees or nourishing beaches and conservation or restoration of adjoining ecosystems like wetlands or dunes. This has been instrumental in building the business case for NbS and elevating demand for more comprehensive approaches for DRR, especially within the context of escalating infrastructure needs and climate change concerns.

Indiana dunes state park © 12019 from Pixabay

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Climate change will significantly impact existing and future infrastructure (traditional, hybrid, and natural). Increasingly shifting environmental conditions will continue to reduce design capacity or performance and shorten infrastructure projects' lifetimes. Increasing costs for adaptation to climate change impacts will be reflected in greater financial flows for actions such as beach nourishment, managed realignment of coastal communities, and elevating and flood-proofing critical assets and infrastructure.

However, GGI can address multiple drivers of risk and provide DRR in ways that conservation and restoration of natural systems or ecosystem-based adaptation (EbA) alone cannot. By combining NNBFs with built or traditional (grey) infrastructure, GGI draws upon the best of engineering achievements to create hybrid interventions that can overcome the limitations of a purely ecosystem-based approach, particularly for significantly altered habitats and human-focused areas. GGI can increase redundancy and synergy between green and grey systems. For example, the conservation and restoration of degraded coral reefs combined with grey structures that reduce wave energy once deployed can enhance recovery rates, strengthen the stability and resilience of the newly established corals and promote expansion of green features over time. GGI also has the potential to reduce the effects of natural disturbances like hurricanes on coastal communities. Thus, GGI offers an opportunity to fundamentally transform the built environment to deliver protection and resilience to some of the world's most vulnerable communities – approximately 1 billion people will be living in low-elevation coastal areas by 2050. More importantly and unlike traditional infrastructure, GGI can promote economic and social resilience through reduction of flood risk, diversification of livelihoods, and enhancement of ecosystem services.

TOWARD TARGETS AND INDICATORS: How to value and evaluate the integration of NbS and Green-Grey Infrastructure Systems

There are several key targets and indicators for valuing and evaluating the application of NbS in GGI for DRR. The primary target is cost-effectiveness, which requires quantification of benefits and co-benefits for the interventions measured through multiple indicators. This may require sizable effort if quantitative and qualitative data are not available or applicable to the proposed intervention(s). However, a cost-benefit analysis can clarify the financial balance while also allowing for comparison against other more traditional approaches.

The magnitude of risk reduction is another important indicator of performance for GGI. The IPCC framework for analysing risk and characterizing resilience can be adapted for GGI. Interventions should follow a holistic and multidimensional approach (space, time, social, ecological, and engineering) that addresses the main drivers of risk on the community and critical infrastructure (conventional, hybrid, or natural). This framework is necessary to clarify interactions, synergies, and trade-offs.

Finally, improving human well-being and ecological stability are the other key targets when valuing and evaluating the application of NbS in GGI for DRR. Indicators related to sustainable and resilient livelihoods, gender equity, fair and inclusive labour, income metrics, community capital frameworks should be explored when determining the degree of influence interventions may have on improving human well-being. Reference and baseline data for healthy ecosystems and long-term monitoring for ecological structure, function, connectivity, and provision of ecosystem services in, around, and beyond the immediately adjacent to the intervention(s) are required for understanding how they affect ecological stability and enhance biodiversity.

RESEARCH NEEDS: Key knowledge gaps in the integration of NbS and Green-Grey Infrastructure Systems

There are several knowledge gaps that exist for the application of NbS in GGI that are not specific to DRR, but they act more generally as barriers to uptake and expansion of NbS and GGI. These include:

Impact data: There is a lack of sufficient data and knowledge to support confidence among practitioners and decision-makers to implement GGI as a consistent adaptation strategy above standard grey only approach. Additional research on the full suite of benefits from GGI in various contexts would facilitate investment and broader policy support.

Technical guidance: Engineers and adaptation professionals need technical and engineering guidelines to manage increasing climate change risk and secure the long-term permanence of GGI. Most engineering and adaptation professionals are trained and proficient in gray-only adaptation approaches; more resources are needed to ameliorate this.

Policy guidance: There is an absence of policy guidance and instruments that incentivize GGI globally and nationally. This includes the ways GGI might be incentivised and prioritised in such national policy frameworks as NDCs as well as NAPs and overall low-emissions development strategies.

Funding and financing: There is a need for better funding or financing mechanisms to integrate NbS and GGI into adaptation planning for urban infrastructure and crucial sectors of the economy like agriculture, ports, and tourism are insufficient to meet the global demand for investment (USD 94 trillion by 2040).

GOOD PRACTICE CASE STUDY

PANORAMA PROJECT

MEDMERRY MANAGED COASTAL REALIGNMENT

LEARN MORE

LOCATION

Medmerry, Selsey, United Kingdom

BENEFICIERIES

Local community on the Selsey Peninsula affected by coastal flooding (towns of Selsey, East Wittering; Bracklesham, Church Norton and other smaller villages); Sussex Beach Holiday Village, farmers, caravan park inhabitants, local business owners.

CHALLENGE

In response to increased coastal flood events and resulting damages, the Environment Agency of the United Kingdom delivered a GBP 27 million project to realign the defences inland, providing significantly improved flood defences to allow for managed flooding. Medmerry was historically protected by a narrow shingle embankment, holding back only the very smallest coastal storms. This posed significant actual and potential risks to life and caused damage to property and infrastructure with increased flood events, and the additional coastal squeeze caused losses of coastal habitat. With the help of IUCN, a full assessment against the criteria and indicators of the IUCN Global Standard for Nature-based Solutions™ was conducted.

APPROACH

Medmerry was one of the first large-scale managed realignment projects in the United Kingdom. Re-imaging a change to the landscape at this scale was scary and not welcomed by the community. To overcome these challenges, the approach was adapted and with

Aerial shot - September 2013 © Environment Agency

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the community and local businesses working to create a space which was more than a flood defence. Placing greater emphasis on community engagement and understanding the concerns, fears and hopes of the people living around Medmerry was key in making the intervention a success. Through this, additional opportunities emerged that were not considered during the original planning, such as the role and benefits for local businesses. This space for engagement has paved the way for future iterations of realignment elsewhere and has become a focal point for the area, with businesses changing their name to mirror Medmerry and create new eco-tourism opportunities. Working with Nature to reduce flood risk has done more than any traditional approach could have.

INTEGRATED IMPACT: ADAPTATION, BIODIVERSITY, MITIGATION

The main positive impacts of the Medmerry managed coastal realignment include improved flood risk management, creation of 300 hectares of wildlife habitats, enhanced landscape quality and provision of recreational facilities. Flood risk has been reduced from an annual overtopping of the defences to a likelihood of less than 0.5% in any given year, which not only benefits over 300 houses but also a waste water treatment works serving the local area. In 2014, there was a storm which would have previously caused some £6 million of damage to the wider economy, but with the new defences in place, passed without incident. Coastal habitat which is being lost elsewhere has been given space to grow, with dramatic uptake by wildlife, including fish, birds and even sharks. Similarly, following comprehensive community engagement, the site is now one the local residents are proud of, with visitor numbers in the region of 20,000 plus per year.

KEY SUCCESSES

Economically viable solution: A cost effectiveness assessment of the planned intervention and an options appraisal was undertaken during the planning phase. Economic benefits derived from the Nature-based Solution include around GBP 91.7 million in economic benefits (including GBP 13.5 million in environmental benefits). The coastal realignment contributed to the protection of more than 300 residential and commercial properties as well as infrastructure. An estimated 22,000 people visit the area annually supporting the local economy.

Robust monitoring framework: The expected benefits of the coastal realignment were documented in the planning phase and baselines established. These informed the ongoing monitoring of impacts. Immediately after project completion, a 5-year monitoring programme was implemented.

KEY PUBLICATIONS AND RESOURCES

- The Green-Gray Infrastructure Funding and Finance Playbook by the Global Green-Gray Community of Practice (G3COP).
- The Practical Guide to Implementing Green-Gray Infrastructure by the Global Green-Gray Community of Practice (G3COP).
- The International Guidelines on Natural and Nature-Based Features for Flood Risk Management, by the U.S. Army Corps of Engineers (USACE) Engineering With Nature® (EWN) Initiative.

CROSS-CUTTING: HUMAN RIGHTS

KEY CONTRIBUTORS: FOREST PEOPLES PROGRAMME, SWEDBIO

STATE OF KNOWLEDGE: What is the role of Human Rights in NbS

For Indigenous peoples, NbS include and reflect practices that they have used for generations, understanding people and nature as co-existing, in harmony and in unity with each other (Ole Rlamit, et al, 2022). Indigenous Peoples and local communities have been practising these approaches in a holistic manner for millennia, emphasising the interdependence of cultural and biological diversity and the reciprocal relationship between people and nature that shapes their natural environment. This results in sustainable resource use and governance, promotes good living and has been handed down through generations.

Indigenous Peoples, local communities, women and youth play a significant role in addressing the global crises of biodiversity loss and climate change including through NbS, and particularly through environmental stewardship. The vast majority of the lands of Indigenous Peoples and local communities (~90%) are categorised as being in an adequately healthy ecological condition (IUCN, 2021), over a third of critically important intact forest landscapes are on the lands of Indigenous peoples (Fa J. et al., 2020), and over a third of currently identified Key Biodiversity Areas (KBAs) are also found within their lands (WWF et al., 2021). These insights provide sound evidence for Indigenous Peoples and local communities' historical and current sustainable approaches to the conservation of biodiversity and underscore the need to ensure their involvement in responses to the biodiversity and climate crises. However, inclusion of Indigenous Peoples and local communities and other actors in NbS practices stands not only on the basis of ecological validity, but also as a matter of human rights and rectification of historic injustices.

NbS interventions can have a positive effect by addressing the aggravating impacts of climate change, however, if poorly designed and implemented, NbS can have catastrophic effects. For

Patacancha, Peru, Indigenous peoples © Yuri Rodriguez Rodriguez from Pixabay

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instance, the imprudent protection of land and natural resources, including through exclusionary practices, can physically and economically displace women, youth, Indigenous Peoples and local communities, and erode their cultures. Nowadays, the promotion of NbS has raised diverging and opposing views, including from those concerned about the commodification of nature and corporate greenwashing, seen as further exacerbating threats to the rights and livelihoods of Indigenous Peoples, local communities, women and youth. It is essential that NbS offer space to engage all actors, including Indigenous Peoples, local communities, women and youth, and foster all-encompassing views that link nature loss and human rights.

TOWARD TARGETS AND INDICATORS: How do you value and evaluate the role of Human Rights in NbS

In the context of actions designed to address climate change and biodiversity loss, identifying and considering key groups whose rights must be respected and protected is essential. These key groups include Indigenous Peoples, local communities, women and youth who rely closely and directly on natural resources for their livelihoods, well-being, and cultural survival. For these reasons, implementing a human rights-based approach throughout the lifecycle of NbS is crucial. The Synthesis Report of the IPCC Sixth Assessment Report and the IPBES report on Diverse Values and Valuation of Nature both underline that climate and biodiversity actions that follow a human rights-based approach lead to more sustainable outcomes and support transformative change. The Kunming-Montreal Global Biodiversity Framework also commits all parties to adopting such an approach. A human rights-based approach (HRBA) requires NbS policies, principles, and actions to actively seek ways to respect, promote, and fulfil human rights (Forest Peoples Programme et al., 2022), and guides the identification of whose and which rights are most likely un-met, un-fulfilled, or violated.

To achieve a human rights-based approach it is essential to recognize the key role of Indigenous Peoples, local communities, women and youth, with their innovations and practices which are based on traditional knowledge and customary practices in NbS. To strengthen representation and effective engagement of key groups, free prior and informed consent (FPIC) processes are needed in all stages of NbS project lifecycle. Furthermore, both the IUCN Global Standard for NbS and the NbS Guidelines by the Nature-based Solutions Initiative set the requirement of having inclusive, transparent, and empowering governance processes (Criterion 5). Such processes should strengthen and support their agencies to effectively assert their voices in policy and decision-making processes for successful realisation of NbS.

Women, including indigenous women, are key actors in NbS. They are disproportionately impacted by climate change, and therefore should be appropriately represented in the development and implementation of NbS. By adopting a holistic gender-transformative approach to NbS which focuses on the economic, political, ecological and cultural causes of vulnerability of different groups, NbS can be co-designed to address the root causes of vulnerability by transforming power relations shaped by unequal patriarchal and discriminatory norms and practices. This can facilitate overcoming barriers to the visibility and voice of marginalised actors, and result in a better recognition of the importance of tailored approaches to address the differentiated needs of actors in a system.

There is growing evidence that NbS that are locally adapted and locally-led through the involvement of Indigenous Peoples, local communities, women and youth throughout the life cycle of NbS interventions are more likely to have positive outcomes for both people and the ecosystems on which they depend (Hajjar et al., 2020). Their involvement in NbS is crucial due to their social responsibilities and roles, and differential reliance, access and use of biodiversity. Moreover, establishing their leadership roles in NbS can stimulate the contemporary inclusion of indigenous and local knowledge and, importantly, create the potential for Indigenous Peoples and local communities to increase their adaptive capacity, facilitating their ability to address future environmental issues. Indigenous Peoples and local communities do not need their capacities built, as this deficit-based approach to NbS undermines local agency, choice and context-specific knowledge being mobilised, strengthened and integrated into NbS (Seddon et al., 2021)

There is mounting evidence that a 'values crisis' underpins the intertwined dilemmas of biodiversity loss and climate change and social-ecological injustices (Pörtner et al., 2023; Ivanova & Lele, 2022). Values-centred approaches have been shown to have the most transformative potential, especially those which are rights-based and focus on a plurality of ways in which diverse actors value nature and its contributions to well-being, and thus should inform the co-development of value-centred targets and indicators (IPBES, 2022) Moreover, NbS should include consideration of land and territory inequalities and foreground access to justice, environmental defender rights (Butt et al., 2019) as well as effective grievance mechanisms.

KEY RESEARCH NEEDS: Key knowledge gaps in Human Rights in NbS

Increased investment in gender-responsive research: Address the scarcity of literature on gender, climate change, and NbS and discuss the merits of bolstering NbS funding projects which secure women as key actors to support the expansion of this important body of literature.

Power-aware stakeholder mapping: Highlight the need to increase the utilisation of stakeholder mapping which includes power analysis in NbS projects to reduce intervention failure and increase success by heightening the understanding of disparate stakeholder influence patterns – paying particular attention to the merits of emphasizing and enhancing Indigenous Peoples and local communities and gender-inclusive strategies.

Improved benefit-sharing: Discuss the historic exclusionary design of technical and financial aspects of NbS, which undermines the ability of Indigenous Peoples and local communities to successfully participate in NbS markets, such as the development of payment of ecosystem services and carbon offsets. Consider benefit-sharing agreements for equitable distribution. There is a need to review and establish some necessary financial mechanisms on ways to improve, decolonise, accelerate, and scale climate finance opportunities for Indigenous Peoples and local communities, i.e., enhance Indigenous Peoples and local communities-led finance opportunities.

Grievance mechanisms: Better understand and communicate grievance mechanisms within an NbS project lifecycle and how actors can access mechanisms to enhance justice and co-develop strategies for reflection and reviewing where injustices might have occurred.

Intersectional approach: Consider the intersectionality approach in NbS, to assist with identifying the socio-structural nature of discrimination, marginalisation and inequity, and that even within groups categories such as 'Indigenous People' and 'women' embody diversity with unique experiences and needs. By surfacing these intersecting issues, more contextually relevant interventions can be co-developed for enhancing rights, empowerment, and agency.

Rights of nature: While HRBA to NbS are gaining recognition, more work is needed to understand opportunities for including the adoption and implementation of legal systems that recognise, respect and enforce "Rights of Nature" as complementary and reinforcing approaches.

KEY PUBLICATIONS AND RESOURCES

- Kimaren Ole Rlamit. 2022. Nature-Based Solutions: A Synopsis of Indigenous Peoples' Experiences, Gaps in Practice and Potential Actions. Tebtebba & ELATIA.
- Tebtebba. 2022. The Contributions, Perspectives and Recommendations of Indigenous Peoples on Nature-Based Solutions (Infographic).
- Forest Peoples Programme. 2022. Re-thinking nature-based solutions: seeking transformative change through culture and rights.
- Carthy, A., Landesman, T. 2023. Beyond inclusion: a queer response to climate justice. IIED. London
- Garnett et al. 2018. A spatial overview of the global importance of Indigenous lands for conservation. Nature. 2018.
- FAO and FILAC. 2021. Forest governance by indigenous and tribal peoples. An opportunity for climate action in Latin America and the Caribbean. Santiago.

CROSS-CUTTING: DECENT WORK

KEY CONTRIBUTORS: IUCN, ILO, UNDP

STATE OF KNOWLEDGE: The role of NbS in Decent Work

Nature-based Solutions (NbS) are recognized for their potential to provide socio-economic benefits, as well as combating climate change and addressing biodiversity loss. The implementation of NbS thus requires an understanding of not only environmental impacts, but also socio-economic benefits. The generation of decent work through NbS is an important component of this, with data and understanding emerging. In a collaborative effort, ILO, UNEP, and IUCN prepared and published a first report Decent Work in Nature-Based Solutions 2022 of a biennial series aimed at addressing this issue (ILO et al., 2022). Decent work, which can be a factor in increasing social equity, refers to productive work that ensures, amongst other things, fair income, workplace security, social protection, personal development, equal opportunities, and the right of workers to organize. Green jobs, a subset of decent jobs in the environmental sector, contribute to preserving or restoring the environment and reducing greenhouse gas emissions.

While some employment opportunities in NbS can be considered decent work and green jobs, not all work in NbS falls under these categories – nor do all green jobs meet the criteria of NbS. Because impact on employment is a relatively new consideration in the design of NbS, if not fully integrated, negative employment impacts may occur. This stresses the need for the involvement in decision making, planning and implementation of those impacted by NbS, and an expansive understanding of the field of impact and affected actors involved. There needs to be understanding on not only the full range of benefits NbS can deliver but also the potential risks if NbS are not implemented appropriately.

There are many challenges to estimating the number of current jobs or total employment in NbS, including data limitations, especially the lack of direct correspondence between the available

Woman collecting lotus flowers, Cambodia © Marco Torrazzina from Pixabay

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employment data and NbS activities, and the inability of economic modelling to capture different forms of employment that are likely to result from NbS. With these caveats, an estimated 75 million people are currently working in NbS, equivalent to about 14.5 million full-time jobs. The majority of employment in NbS activities is concentrated in the Asia Pacific Region and lower-middle income countries, particularly in the agriculture and forestry sectors. In higher income countries, NbS spending focuses on ecosystem restoration and natural resource management. Public services and construction sectors also contribute to NbS work in these countries. There were also indications that there were important decent work deficits in many of these jobs and that care needs to be taken to address this as the use NbS is scaled up. Volunteering also plays a role, with an estimated 16 million volunteers engaged in various NbS activities.

Scaling up investment in NbS by tripling expenditure by 2030 could potentially create around 20 million additional jobs, with a significant portion generated in Asia and Africa. The majority of these jobs would be in the agriculture and forestry sectors.

TOWARD TARGETS AND INDICATORS: How to value and evaluate the integration of NbS and Decent Work

Just transition policies are crucial in ensuring that the implementation of NbS leads to the creation of decent work opportunities and that measures are put in place to mitigate job losses, displacement and negative impacts on livelihoods. This is especially important in rural areas. Without such policies, the employment in NbS may result in continued decent work deficits. Inaction in developing and implementing just transition policies could deepen inequalities, reduce productivity, and increase social discontent. The goal of a just transition is to seize the opportunities arising from a green transition while minimizing and putting in place measures to mitigate its negative impacts on workers and enterprises. The ILO Just Transition Guidelines provide a framework for this. They stress the importance of the participation of social partners, women, and Indigenous Peoples in decision-making and planning. They also share common themes with the IUCN Global Standard for NbS, such as evidence-based decision-making, stakeholder engagement, policy coherence, and upholding rights, and are complementary in supporting the promotion of decent work and NbS.

Understanding the interactions between NbS, work, and decent work is crucial for informing policies and interventions, and assuring a just transition. However, besides this report series there is currently no other systematic effort to measure and analyse the quantity, duration, and decent work dimension of employment generated by NbS investments. Without a better understanding of the role of NbS in creating employment, it will be challenging to develop appropriate policy frameworks and secure necessary financing.

The Decent Work in Nature-Based Solutions 2022 report proposed a conceptual framework and measurement framework to support the discussion of decent work in NbS and inform policy integration. The measurement framework includes indicators for employment, decent work, and unpaid forms of work in NbS. Two approaches were explored in the report: integrating existing data based on statistical standards and using modelling tools to estimate employment in NbS. The complementary approaches provided partial insights into the quantity and quality of work in NbS. As data improves, the results from the two approaches can strengthen each other and provide better understanding. Adopting a measurement framework and initiating indicators is key to supporting the development of a comprehensive system integrated with existing statistical frameworks for better measurement of employment in NbS in the medium to long term.

RESEARCH NEEDS: Key knowledge gaps in the integration of NbS and Decent Work

Further research and data collection are needed to understand the employment impacts of NbS more comprehensively, including gender-related issues. Two specific areas of need include:

More Comprehensive Data: The estimates on current and future employment in NbS are partial and based on limited data, and they do not capture potential job losses or displacements. In addition to the expected positive environmental impacts, the transition to increased adoption of NbS can pose risks to jobs and livelihoods, requiring just transition measures such as job placement services, re-employment training, and social protection measures.

Forward Looking Assessments: Challenges exist in estimating the current and future employment in NbS due to data limitations, the complexity of separating net effects, and the difficulty in assessing the quantity and various dimensions of quality of work in NbS activities. Further, the estimate on additional job creation by 2030 presented in the 2022 Report, may still underestimate the employment potential of NbS, as it does not include a range of potential uses of NbS such as climate change adaptation, disaster risk reduction, and food security. Moreover, challenges also remain in estimating volunteer work in NbS.

KEY PUBLICATIONS AND RESOURCES

- ILO-UNEP-IUCN (2022) Report on Decent Work in NbS
- ILO (2015) Just Transition Guidelines

CROSS-CUTTING: FUNDING AND FINANCE

KEY CONTRIBUTORS: UNEP

STATE OF PLAY: What is the role of private and public funding and finance for NbS

The need to mobilise finance to support the implementation of NbS to address climate change and biodiversity loss at scale is increasingly urgent. The already high risks and economic costs of insufficient action are growing. Over half of the world's gross domestic product (GDP) is dependent on nature. The world economy is set to lose up to 18% GDP from climate change if no action is taken (Swiss Re 2021). The collapse of ecosystem services provided by nature, e.g., pollination, food from fisheries, and timber from native forests, could result in a decline in global GDP of USD 2.7 trillion annually by 2030. Addressing climate and biodiversity challenges in an integrated manner through NbS can be efficient and cost effective as well as providing multiple benefits to people and nature. NbS provide critical tools to help address global challenges, but their potential can only be reached if they receive the finance needed to scale implementation.

The United Nations Environmental Program's (UNEP) State of Finance for Nature 2023 report estimates that total annual finance flows to NbS in 2022 were roughly USD 200 billion. Public finance accounts for the largest share at 82% (USD 165 billion). Of this, 99% is spent domestically, predominantly on NbS related to biodiversity protection and sustainable agriculture, forestry, and fishing. Private finance for NbS is estimated at USD 35 billion (18% of total finance flows to NbS). More than half of private NbS finance is channelled through biodiversity offsets and sustainable supply chains. Private finance flows to NbS have recently increased by USD 3 billion (10%), due to growth in biodiversity offset markets, sustainable supply chains, and impact investment. Other channels for private investment in NbS include payments for ecosystem services, carbon markets, philanthropy, and private finance mobilized by the Development Assistance Committee (DAC), Global Environment Facility (GEF), and Green Climate Fund (GCF).

Local farmers produce traditional products from bulrush in shrimp ponds in Phu My, Kien Giang Province © MCF

KEY TARGETS AND INDICATORS: How to set and meet NbS funding and financing needs

The SFN 2023 indicates that current finance for NbS is very far from sufficient to reach climate and biodiversity targets under the Paris Agreement and the Kunming-Montreal Global Biodiversity Framework (GBF). In fact, annual financial flows to NbS need to nearly triple from current levels by 2030 to help limit climate change to below 1.5°C and halt biodiversity loss (SFN 2023). Investment needs for restoration are high this decade, with restoration absorbing USD 125 billion in 2025 with investment needs increasing by 40% to USD 177 billion per year by 2030. Investment needs in Sustainable Land Management (SLM), including agroforestry, improved grazing, and cover crops, increased from 27% (USD 63 billion) in 2025 to 45% (USD 241 billion) of NbS finance by 2050. As many NbS based on SLM generate financial revenues, SLM provides an important opportunity for private investment and is thereby critical to scale NbS finance.

While protection makes up only roughly 20% of cumulative NbS finance needed to 2050, it represents 80% of total cumulative additional land area required for NbS by 2030. Protection has significantly lower per hectare costs compared to restoration. An increase in the area under NbS that focus on protection and conservation of biodiversity is essential to reach the 30 X 30 target.

Closing the finance gap will require a significant increase in direct public investment in NbS as well as much greater private investment. Governments need to implement and make finance available for commitments made under the Paris Agreement and GBF. Public funding for protection is essential as the protection of ecosystems, including avoided conversion, provides critical public environmental goods and services. To ensure investment in restoration and SLM, governments need to increase domestic expenditure and to provide the incentives and regulatory framework to catalyse private investment.

Raising the necessary finance for NbS interventions can be a complex and slow process and requires action from different players. Governments will need to lead, increasing direct expenditure on NbS and expanding the use of NbS in ODA. Governments are instrumental in creating an enabling environment with appropriate incentives, standards and regulations to catalyse private investment in NbS. Green public procurement can strengthen markets for sustainable supply chains. In the context of increasing and unsustainable sovereign debt levels, debt for nature swaps can provide natural capital-rich, debt burdened countries with the liquidity and resources to fund conservation related NbS. Standards and regulations are critical to redirect finance to more sustainable practices by encouraging or preventing unsustainable activities. Government promotion of sustainable certification and transparency in supply chains can help ensure private sector action.

While climate and biodiversity targets require significant scaling of investment in NbS and while there is often a strong economic case for investment in NbS, the single action with the greatest impact is undoubtedly reducing public expenditure and private finance and activity that harms nature. Government expenditure that negatively impacts nature is ten times greater than expenditure or investment in NbS (State of Finance for Nature, 2023). Tripling investment in NbS will by itself will not solve the crisis, unless the far greater nature-negative finance flows are tackled. For example, despite pledges by governments to reduce fossil fuel subsidies, these have *doubled* from USD 563 billion in 2021 to a staggering USD 1.1 trillion in 2022. And private nature negative flows are many times greater than public nature negative finance flows – State of Finance for Nature 2023 has estimated that one out of every three dollars invested by private entities has a direct negative impact on nature.

IDENTIFYING THE NEEDS: Key barriers to funding and financing NbS

In 2022, WWF-UK commissioned a review of barriers to accessing finance for, and investing in, NbS. The intent was to gather data on the global finance sector's perspectives and motivations regarding barriers to investment to facilitate design of solutions to those barriers. The top 5 barriers were as follows:

Information on returns and impacts: While good tools for measuring impact may exist, they face scale and cost challenges. Meanwhile, an almost complete lack of transparent and benchmarked data on market rates and returns is holding back mainstream investors.

Capacity and finance sector: NbS is still too difficult a theme for easy 'processing' in large financial institutions which lack the staff or structures to address it properly.

Supply: Despite efforts to accelerate and develop projects, the pipeline is still poor – volume is low, and the details that do exist are often too small and not financially viable.

High project-level risks: Many inherent characteristics of NbS projects mean that they suffer from poor economics and high levels of risk, except for some carbon projects.

Standardization and structures: There is a lack of standards on NbS that are trusted by financial institutions, and very little standardization in the transaction structures used.

KEY PUBLICATIONS AND RESOURCES

- Swiss Re Institute (2021). The economics of climate change: no action not an option
- State of Finance for Nature (2023). State of Finance for Nature
- WWF (2022). Nature Based Solutions – a review of current financing barriers and how to overcome these
- PLOS Climate, Oxford (2023). Going beyond market-based mechanisms to finance nature-based solutions and foster sustainable futures | PLOS Climate

CROSS-CUTTING: HEALTH SYSTEMS

KEY CONTRIBUTORS: WHO

STATE OF PLAY: The role of NbS in Health Systems

Biodiversity loss is happening at an unprecedented rate and is increasingly being recognised as posing a significant risk not only to healthy and stable ecosystems, but to all aspects of human health which rely on ecosystems and ecosystem services functioning well. Decline in biodiversity can trigger outbreaks of infectious diseases, threaten nutritional security and weaken protection from natural disasters (WHO, 2015). Biodiversity loss is occurring rapidly with a reported average decline of 69% in species populations since 1970 which, coupled with climate change, is detrimentally affecting the ecosystems upon which a healthy society depends (WWF, 2022). Already, conservative World Health Organization (WHO) statistics assert that 23% of global human deaths and 26% of deaths under five are caused by preventable environmental factors (WHO, 2016), and future estimates declare that between 2030 and 2050, the effects of climate change on human health will result in approximately 250,000 additional deaths per year, with the health cost somewhere between USD 2-4 billion per year (WHO, 2023). Climate change will result in more heat-related illnesses as a result of rising temperatures; higher incidents of respiratory issues linked to worsened air pollution; increased number of vector-borne diseases as the geographical ranges of mosquitoes and ticks expand; growing cases of waterborne diseases resulting from unclean water; and the disruption of food security as droughts and floods damage crops.

Safeguarding human health from the aforementioned risks requires working in tandem with conservation and climate change adaptation and mitigation to ensure healthy and stable ecosystems. Looking at the climate- biodiversity- health nexus via a Nature-based Solutions (NbS) lens can act as a viable solution to quelling future ill health and offer co-benefits to both biodiversity and human health, while limiting trade-offs, as long as NbS are well-designed and inclusive of vulnerable populations.

Environmental pollution © Ralf Vetterle from Pixabay

NbS for adaptation have the potential to build community resilience, protect against climate-induced disasters, and enhance not only water and air quality, but sustainable food systems too. Green and blue infrastructure, such as urban parks and green spaces, act as buffers against extreme weather events, protecting vulnerable populations (WHO, 2022); and natural infrastructure, such as wetlands and mangroves cushion the adverse impacts of hurricanes[5] and floods (Watts et al., 2019). Watershed restoration and natural water storage systems ensure access to clean and reliable water sources, critical for public health during droughts and water scarcity (World Bank, 2020); and green spaces and vegetation function as natural air filters, reducing air pollution and associated health impacts (Nowak et al., 2006). NbS can also work to mitigate the effects of climate change via afforestation, reforestation, and sustainable land management, sequestering CO_2 from the atmosphere; contributing to the reduction of global temperatures, and lessening the health risks associated with extreme heat as well as zoonotic and vector-borne diseases (IPCC, 2019). Restoring 350 million hectares of degraded land, for example, could sequester up to 1.7 gigatonnes of CO_2 equivalent annually (IUCN, 2021), and restoring blue carbon coastal ecosystems is vital as they can sequester up to 4 times more carbon per unit than terrestrial forests (Murray et al., 2011). NbS have the potential to aid in the conservation of biodiversity by preserving and safeguarding healthy ecosystems, as ecosystem restoration can directly contribute to biodiversity conservation. Habitat creation, such as the establishment of wildlife corridors or protected areas within or near urban areas, can provide safe spaces for wildlife to thrive. In addition, biodiversity in crop varieties and fish species is essential for food security and genetic diversity also helps build resilience to environmental changes, including disease outbreaks (WHO, 2021). NbS approaches are living solutions which inherently work in harmony with nature and offer a path forward which mutually benefits both human and planetary health.

KEY TARGETS AND INDICATORS: How to value and evaluate the integration of NbS and Health Systems

To effectively value and assess the application of NbS to health systems, it is crucial to acknowledge the diverse ways in which nature influences human well-being. NbS should be intricately tailored to specific contexts, aligning with distinct objectives while optimizing synergies and minimizing trade-offs. Emphasizing the need to implement NbS for health that address the most pressing health concerns within each unique setting is essential. To maximize their impact, NbS approaches should target symbiotic benefits for health, leveraging the profound relationship between nature exposure and mental and physical well-being, potentially reducing morbidity and offering psychological relaxation. Additionally, the array of evaluation frameworks available must be recognized and harnessed to optimize the application of NbS. Finally, a strong emphasis should be placed on identifying, benchmarking, and regularly assessing human health outcomes resulting from NbS, fostering accountability, and reinforcing adaptive management practices.

RESEARCH NEEDS: Key knowledge gaps in the integration of NbS and Health Systems

Below are the knowledge gaps in the application of NbS for health systems, reflecting areas where further research and understanding are needed to maximize their effectiveness:

5 This is called a typhoon in the western North Pacific and South China Sea; a hurricane in the Atlantic, Caribbean, Gulf of Mexico, and in the eastern North and central Pacific Ocean; and a tropical cyclone in the Indian Ocean and South Pacific region (Miththapala, 2008)

Enhanced Sector Collaboration: The success of NbS in promoting health and well-being hinges on fostering a profound understanding and collaboration between the conservation and health sectors. Achieving this synergy requires the development of robust partnership frameworks and the facilitation of cross-sectoral knowledge exchange.

Expanded Toolkit for Implementation and Evaluation: There is an urgent need for the development and expansion of a comprehensive range of tools and methodologies. These resources should be designed to guide and inform every stage of NbS implementation and evaluation, ensuring their effectiveness and adaptability.

Embracing Interconnected Health Realities: Recognizing the intricate interconnections and interdependencies among human, animal and environmental health is paramount. This understanding should instil a clear sense of collective ambition and a systems-thinking mindset. These attributes are essential for promoting collaborative, holistic approaches to health and environmental challenges.

Leveraging the One Health Initiative: Highlighting the significant work of the One Health initiative and demonstrating the benefits of enriching such collaborative endeavours is crucial. One Health and similar projects play a pivotal role in advancing NbS for health systems.

KEY PUBLICATIONS AND RESOURCES

- WHO, IUCN (2023). *Designing Nature-based Solutions for Health: Integrating Biodiversity, Climate Change and Health Outcomes*
- WHO (2021). The Health Argument for Climate Action
- WHO (2018). Preventing Disease through Healthy Environments
- WHO, CBD (2015). Connecting Global Priorities on Biodiversity and Human Health: State of Knowledge Review
- IPBES (2019) Global Assessment Report on Biodiversity and Ecosystem Services
- The Lancet (2023). Lancet Countdown on Health and Climate Change
- WHO-IUCN Expert Working Group on Biodiversity, Climate, One Health and Nature-based Solutions, established March 2021 with Friends of EbA (FEBA)
- WHO (2020). Guidance on Main-streaming Biodiversity for Nutrition and Health

ANALYSIS

IMPACT

Developing the ENACT Dashboard

BUILDING TOWARD THE BASELINES: What is the current capacity to track actual NbS for climate change and biodiversity outcomes?

For many decades, ENACT partners and other members of the sustainable development community have been implementing actions towards the delivery of numerous global goals for addressing climate change, biodiversity, and land degradation. It is crucial that these contributions for nature are collectively documented and there is understanding on where and when they are being implemented, by whom, and how much they are contributing towards global goals, such as the UN Sustainable Development Goals, the Paris Agreement, the Kunming-Montreal Global Biodiversity Framework, the G20 Global Initiative on Land Degradation.

The ENACT Partnership's NbS Goals were adopted to facilitate investment for NbS through clear benchmarking. The objective is for actions contributing to the ENACT NbS Goals to be nested within existing global targets instead of creating additional obligations. They do so in a way that emphasizes the importance of action that integrates climate, biodiversity, and human objectives all at once.

In 2024 the ambition is to set baselines along which to monitor progress toward 2030. These baselines and reported progress will be presented through a publicly accessible online dash-

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board. Given the lack of comprehensive and consistent global data on actual NbS progress, the following discussion is on the capacity to track NbS contributions to climate change adaptation, mitigation, and biodiversity enhancement instead of an assessment of actual on the ground NbS achievements.

This is a vital and necessary distinction. While there are several existing platforms and mechanisms that track data on climate change, biodiversity, and human well-being, few track across the three categories through an integrated manner which is essential for NbS, nor do they track achieved outcomes. Instead, indicators are often set, which at best serve as imperfect proxies.

Year one of the ENACT Partnership focused in part on building the ambition of partners for improving the tracking of NbS. As discussed below, the IUCN Contributions for Nature (CfN) platform provides the most systematic mechanism to assess NbS achievements as spatially implemented. Going forward, the Partnership will build on identified areas for investment and updates to further develop the CfN to feed into a linked, publicly accessible online ENACT Dashboard.

Building from the IUCN Contributions for Nature Platform

Mandated by IUCN's Membership of governments, state agencies, regional and local governments, non-governmental organizations, and indigenous peoples organizations, the Contributions for Nature platform (CfN) allows IUCN constituents to document where they are undertaking (or planning to undertake) conservation and restoration actions. It overlays this spatial documentation with global, spatial, high-resolution metrics of biodiversity and for carbon sequestration to report and quantify potential contributions to global environmental goals.

Given the extreme geographic variation of conservation and restoration interventions aimed at enhancing both biodiversity and climate change mitigation, the core of the platform is spatially explicit, and the way that users interact with it is through maps, visualizing locations where constituents are conducting conservation and restoration efforts. Before going through validation, these core spatial data can be complemented by optional information around specific threat abatement conservation and restoration (including forest landscape restoration) actions, financial information, gender, beneficiaries, and collaborations that add detail to the quantification of biodiversity conservation potential, which is calculated by the Species Threat Abatement and Restoration (STAR) metric (Mair et al., 2021) and climate change mitigation measured using the IUCN FLR CO_2 removal database (Bernal et al., 2017).

To date, there are 9854 voluntary contributions[6] documented in the platform from IUCN's government and civil society Members (130 individual IUCN constituents have documented contributions), with the majority situated in the Americas (Figure 5). A extensive presentation of the data from current inputs can be found in Annex 1. Each contribution is a potential NbS, dependent on verification that it does indeed deliver its climate change and biodiversity benefits, and of course also meet the other NbS criteria. The ambition, facilitated through the support of the

6 The Contributions for Nature portal has been developed to be as simple as possible to use, and requires only eight pieces of information from organisations, some of which are optional or can be added later. Users start by logging in and selecting the area in which they are working. Users can draw a shape directly onto the map, select existing protected areas or key biodiversity areas, upload geographic information files or select a single point with a km^2 radius.

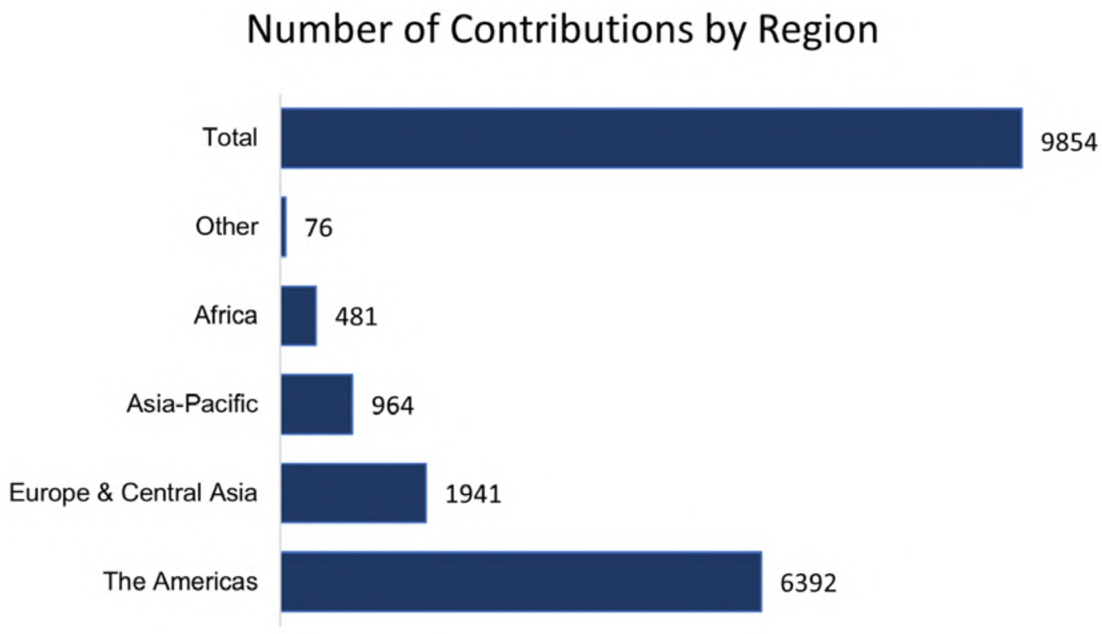

Figure 5: Distribution of the contributions across regions. The Other region refers to the small number of contributions that do not fit easily into a region, e.g., if they are offshore in the high seas.

ENACT Partnership, is to develop a mechanism through which to verify whether contributions currently tracked in the CfN qualify as NbS, and to increase the number of ENACT Partner's contributions to the platform.

Importantly, the currently available data in the CfN is composed of unvalidated claims, and not explicitly an NbS following the IUCN Global Standard. Methods for achieving this validation are being developed, including the use of proxies as an intermediary step to full validation through the IUCN Global Standard. Further, the tools for validation mentioned below are essential components of monitoring toward validated NbS, but are not as of yet sufficient to provide such verification.

Evaluating potential climate change adaptation benefits through the Contributions for Nature Platform

Climate change adaptation and the related goal of resilience are difficult outcomes to track. While monitoring progress for climate change mitigation can be linked to the clear 1.5°C Paris Agreement target with a concrete metric set through emissions, i.e., CO_2e reductions, adaptation and the achievement of resilience are highly localized and varied with no clear metric nor target. While achieving the objective of the Global Goal on Adaptation framework to monitor progress on climate change adaptation will be essential for a full picture of global resilience, it is clear from current data on SDGs that the world is dramatically behind in meeting a range of linked economic, social, and environmental goals, indicating a shortfall in achieving the conditions necessary for successful climate change adaptation.

While the Contribution for Nature Platform (CfN) has the current capacity to monitor resilience through data on beneficiaries, the ambition is to build a system that monitors resilience through a more comprehensive set of indices.[7] For this purpose, the current work of establishing a baseline for this goal involves mapping data available through relevant global targets and indicator frameworks, to identify those that would adequately represent achievements of NbS—meaning actions that positively affect human development, climate, and biodiversity at once. Many of the Sustainable Development Goals (SDGs) and their targets are directly related to climate adaptation and resilience, as documented in the UN's Climate and SDG Synergies report. Most specifically those related to poverty, hunger, access to water, and terrestrial and marine ecosystems, infrastructure and urban settlements. Linking the ENACT Dashboard to monitoring already underway through these goals offers a possible foundation to build the desired tracking capacity.

Documentation of potential biodiversity benefits in the Contributions for Nature Platform

At the core of NbS is the objective of securing and enhancing the broad range of benefits from biodiversity. However, without a universal, scalable, globally applicable, and additive way of measuring a project's potential impact on biodiversity it is impossible to compare and coordinate evaluation of impact across the many facets of NbS being implemented in different places in different ways. For these and other reasons, it is not currently possible to quantify the individual or collective impact of NbS towards global goals for biodiversity. To resolve this problem, a global, spatially explicit, high resolution, robust, scalable, additive, and meaningful metric of biodiversity is needed.

The Species Threat Abatement and Restoration (STAR) metric goes part of the way toward meeting this need. The STAR metric allows business, governments, and civil society to quantify their potential contributions to stemming global species loss, and can be used to calculate national, regional, sector-based, or institution-specific targets (Figure 6). The scientific basis for STAR was established in the report 'Measuring spatially-explicit contributions to science-based species targets', published in *Nature Ecology & Evolution* and based on the IUCN Red List of Threatened Species, in a collaboration between 55 organisations (Mair et al., 2021). The IUCN Red List is the most comprehensive global assessment of the status of biodiversity. Despite this significance, it is important to note existing debates about the best metrics for measuring biodiversity and the fact that various tools, including the STAR metric are often ideally used in companion with other methods for assessing ecosystem integrity.

Because biodiversity is distributed unequally around the world, STAR assesses the potential of specific actions at specific locations to contribute to international conservation targets. STAR estimates the contribution of two kinds of action to reduce species extinction risk – threat abatement (addressing threats to species in their current habitat), and habitat restoration (restoring species to the 1992 historical habitat). The total global STAR Threat Abatement score is 1,223,400, and the total STAR Restoration score is 683,836.[8]

7 Relevant global targets & indicators include: UNDRR (Sendai Framework), UNSG/WMO (Early warning systems), World Food Programme (Global Shield against Climate Risks), UN SDGs, CBD KMGBF, Sharm el-Sheikh Action Agenda, UN WHO (Triple billion), Race to Resilience, Indigenous Peoples and Local Communities pledge, UNSD Global Set, G20 Global Initiative on Land Degradation.

8 More information about the STAR metric and corresponding calculations can be accessed here.

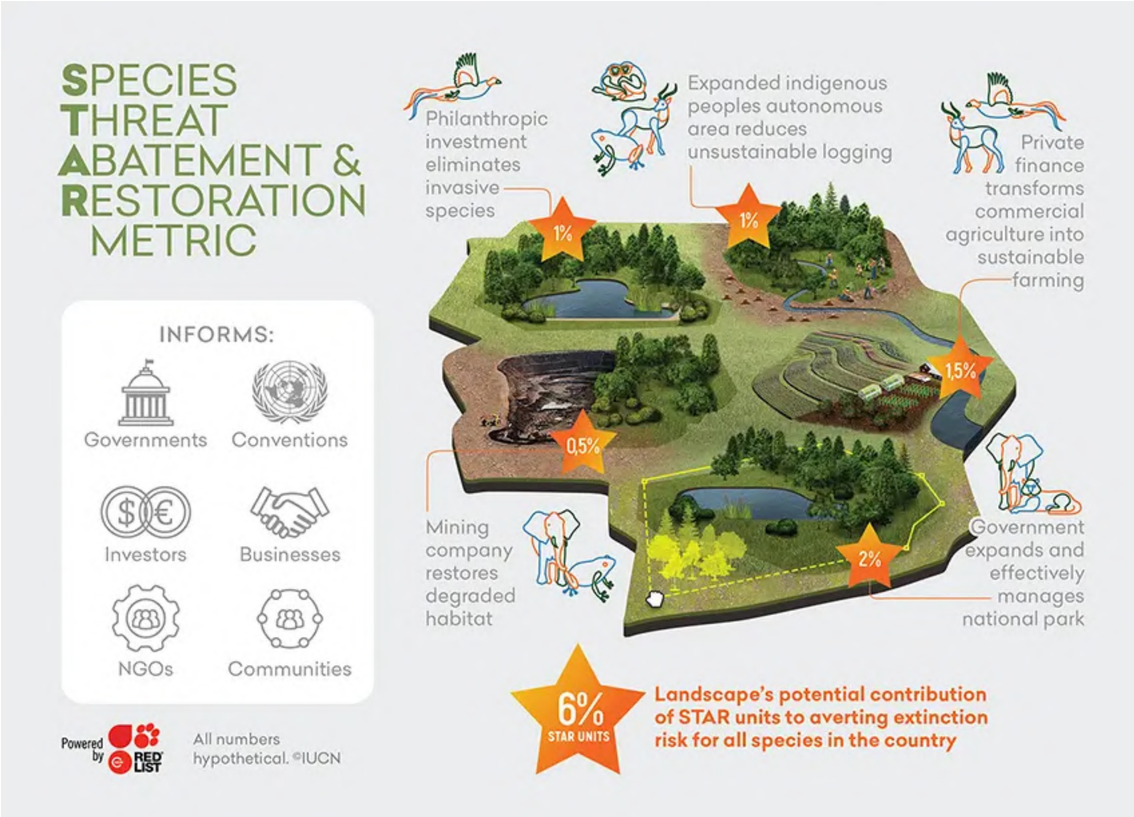

Figure 6: The Species Threat Abatement and Restoration (STAR) metric.

These global scores make it possible to compare specific threat abatement and habitat restoration actions in different places toward reducing global species extinction risk, which helps companies, countries, and others plan their conservation efforts and quantify the extent to which a particular NbS, or collection of NbS, deliver biodiversity benefits. While the STAR metric allows for measuring and monitoring of protected areas, there is work to be done on tracking the goal of sustainable management within the ENACT NbS Goals, specifically work that enables verification of sustainable management practices and accounts for the contribution of these practices to biodiversity. This will be a tandem pursuit in association with establishing a baseline for biodiversity enhancement in 2024.

STAR in the Contributions for Nature Platform

As the STAR metric forms the biodiversity basis of the Contributions for Nature platform, it is now possible to use the platform to measure the contributions of specific NbS interventions towards biodiversity goals. The 9854 contributions currently documented in the platform represent 18.9% of the global terrestrial conservation opportunity for reducing species extinction risk through threat abatement, and 9.2% of the opportunity for reducing species extinction risk through restoration. Considering this comes from fewer than 10,000 sites, this is a significant proportion of the potential global opportunity. So far, significant variation across regions is observed, with relatively fewer contributions documented as taking place in Africa, the region with the highest average opportunity. As the number of users, and the number of contributions documented in the platform increases, these patterns may change. In addition, as the sample size grows, it will become possible to draw conclusions around more granular data, such as the specific threats being abated through NbS, the gendered impacts, and the annual budgets required.

Documentation of potential climate change mitigation benefits in the Contributions for Nature Platform

The current tool for documentation of potential climate change mitigation (i.e., carbon sequestration) was developed from the IUCN FLR CO_2 removal database, which estimates potential climate change mitigation effects by specific forest landscape restoration activities. The ambition is that work undertaken through the ENACT partnership would facilitate expanding this monitoring capacity beyond forest landscapes to include coastal and marine ecosystems, and non-forested terrestrial ecosystems.

Only a small number of contributions documented in the Contributions for Nature Platform to date – 72, to be precise – have completed documentation for forest landscape restoration, which is necessary for estimation of potential climate change mitigation benefits using the IUCN FLR CO_2 removal database.[9] Nevertheless, these data already provide valuable insights into the concerted contributions from IUCN constituents towards climate change mitigation. It is 72 contributions documenting restoration actions, covering 15.4 million ha and potentially sequestering 217 tonnes of CO_2. Among these, one forest landscape restoration intervention type stands out as particularly impactful among these contributions: natural regeneration. As documented in the Contributions for Nature platform to date, natural regeneration is underway across 12.26 million ha of land, potentially sequestering 152 million tonnes of CO_2.

Prospects and Innovations

The documentation presented here reveals substantial potential NbS contributions towards global goals for climate change mitigation and biodiversity enhancement through extinction risk reduction. This documentation has been provided by <10% of the aggregate conservation community as represented by IUCN, and so as further organisations document their actions on the platform, it is anticipated that these potential contributions will increase – and their regional and thematic patterns may change. Work through the ENACT Partnership will focus on enhancing and building this intended documentation and monitoring capacity, with the objectives of developing a separate linked dashboard which would track achievements in relation to the ENACT NbS Goals specifically.

Meanwhile, three major innovations will be underway across the IUCN Contributions for Nature platform over coming years. First, the data underpinning the calculation of potential contributions towards climate change mitigation will be changed to harness wall-to-wall raster carbon data, allowing estimation of potential contributions generated by conservation actions (through avoided emissions) as well as by restoration. Second, data for STAR in freshwater and marine environments will be incorporated, allowing estimation of potential contributions towards global goals for biodiversity in aquatic systems. Third, there is an intention to harness data on potential contributions towards climate change adaptation, likely through disaster risk reduction; specifically, through ENACT's support. Together, these innovations will allow reporting across all three of ENACT's focal areas.

9 As with other ambitions, it is the intention that work under the ENACT Partnership would lead to increased capacity to ensure removals meet criteria of additionality and permanence.

CONCLUSIONS

Key Messages and Actions

Achieving ENACT's vision of enhanced protection and resilience of vulnerable people, secured ecosystem integrity, and significantly increased global mitigation efforts requires stronger international collaboration and commitment. In particular, to the rapid reduction of fossil fuel emissions to limit warming to 1.5°C, as well as the protection, conservation, restoration, and sustainable use of nature and ecosystems. Meeting these goals is essential to the continued provision of ecosystem services for nature and people, and a prerequisite for ENACT's vision to be met. The Partnership recognizes the importance of the COP28 decision text statement to move away from fossil fuels but emphasises that maintaining them as transition fuels dramatically compromises the possibility to avoid the worst impacts of climate change on both people and nature, and severely limits the possibility of safeguarding the effectiveness of NbS. The ENACT Partnership encourages governments and industries to make their NDCs and policies stronger than the decision text. Further, ENACT recognizes that developed countries, given their historical emissions and greater capacity, bear a primary responsibility in curbing climate change through substantial emissions reduction efforts and technological support. Conversely, developing nations require financial assistance from developed counterparts to implement sustainable practices, adapt to climate impacts, and transition towards greener economies.

In complement to this priority, the ENACT Partnership offers three key messages and associated actions, based on the findings of this roadmap. These will serve as the basis for establishing the 2024 work plan of the Partnership, which will be discussed and determined through a collaborative process at the inaugural steering committee meeting in the second quarter of 2024.[10]

INTEGRATE ACTION ON CLIMATE CHANGE, BIODIVERSITY LOSS, LAND DEGREDATION & HUMAN WELL-BEING

The first joint report of the IPBES and IPCC highlights, in a historic way, that climate change and biodiversity loss must be "tackled together" to ensure success. Building from this, the interlinked dynamic of the climate change adaptation and mitigation, land degradation, and biodiversity crises must be recognized and reflected in policy, investment, and technical support, and pathways for human-rights focused protection, restoration, and sustainable management of the world's ecosystems provided.

To achieve this, the ENACT Partnership encourages action and commitments in direct support to the common objectives presented in the COP28 Joint Statement on Climate, Nature and People, led by the UNFCCC COP28 Presidency, CBD COP15 Presidency, and chairs of 10 global

10 All current members will be invited to this hybrid (tbc) meeting through appointment of 1-2 attending representatives.

partnerships including ENACT. In particular, the ENACT Partnership supports the following key actions:

- **Support a whole-of-government approach that mainstreams NbS** coherence and integrated planning and implementation in the next round of Nationally Determined Contributions (NDCs), updated National Adaptation Plans (NAPs), and forthcoming revised National Biodiversity Strategies and Action Plans (NBSAPs).
- **Support the development of globally agreed standardised indicators and tools for tracking integrated progress towards global targets** for climate change, biodiversity, and land degradation in a way that ensures actions comply with the highest relevant NbS standards and protocol, and at minimum ensure the promotion of multiple benefits and with direct access modalities for Indigenous Peoples, local communities, women, girls, and youth, among others.
- **Support coherence and accessibility of data, ensuring metrics and methodologies encourage an integrated approach** for monitoring climate change, biodiversity, and human well-being in a way that does not over-burden reporting requirements and works in collaboration and respect for intellectual property with collaboration across international, non-governmental and private sector organisations, scientific and academic institutions, and Indigenous Peoples and local communities.

ENHANCE THE DESIGN OF FUNDING AND INVESTMENT TO SUPPORT AN INTEGRATED APPROACH

To ensure the full potential of NbS as an integrated approach, existing funding mechanisms need more than increased commitments. The design of finance and funding should accommodate the specific timescales, research priorities, and other specific implementation demands of NbS, and ensure that the issues of climate change, biodiversity loss, land degradation, and human well-being are not funded in silos.

To achieve this, the ENACT Partnership encourages actions and commitments in facilitation and enhancement of the objectives presented in the UAE Leaders Declaration on a Global Climate Finance Framework. In particular, the ENACT Partnership supports the following **key actions**:

- **Ensure that NbS has priority** allocation in the mobilization of concessional finance towards the USD 100 bn goal to support developing countries in their climate objectives through to 2025. Further, the COP28 Presidency's call for a doubling of adaptation finance and replenishment of the Green Climate Fund, and the scaling up of finance under the Kunming-Montreal Global Biodiversity Framework and rapid operationalization of new funding arrangements for responding to loss and damage should all occur in a way that facilitates the integrated approach of NbS.
- **Increase and enhance the impact of bilateral and multilateral funding mechanisms in supporting an integrated approach** by encouraging funding streams that prioritise UNEA 5/5 aligned NbS. The success of this action will demand corresponding work to enhance the responsiveness and accessibility of foreign investment, and the improved integration of all development and conservation funds through common country platforms. Further, risk-sharing models should ensure that there is not a prioritization of private gain at the expense of public risk burden.
- **Invest in enhancing a joint understanding of the benefits of NbS to support confidence among practitioners and decision-makers in implementation**, particularly from a

financial perspective. Build a better global understanding of the value of NbS across different contexts and systems, and how they can be incentivised through policy mechanisms, while recognizing the limits of traditional market-based solutions and the fact that returns on NbS are not always compatible with private sector expectations and very often require non-debt-instruments to be successful and equitable, particularly when appropriately targeted to the most vulnerable.

ENSURE INCLUSIVE DECISION MAKING ON ALL POLICY PROCESSES, INVESTMENT DECISIONS, AND IMPLEMENTATION DESIGN RELATED TO NBS

The achievement of the maximum equitable and socially just NbS outcomes requires inclusive decision-making processes that involve diverse actors and balance power across decision making. This approach adopted depends on the decision-making context but should be designed with use of the indicators of criterion 5 of the IUCN Global NbS standard. An inclusive approach not only bolsters the social impact of NbS but also aligns them with local ecological conditions and fosters a sense of ownership and stewardship.

To achieve this, the ENACT Partnership encourages actions and commitments in direct support of the COP28 Gender-Responsive Just Transitions and Climate Action Partnership declaration in combination with the common objectives presented in the COP28 Joint Statement on Climate, Nature and People. In particular, the ENACT Partnership supports the following **key actions**:

- **Prioritize the increase of gender-responsive funding aimed at and accessible to women and girls, as well as funding for Indigenous People's led work** in the regions most impacted by climate change. Do this in a way that facilitates NbS and improves tracking and reporting on gender-related and Indigenous People-relevant aspects of climate finance, impact measurement and mainstreaming in a way that contributes to development of further investment and good practice data for an integrated approach.
- **Increase the capacity to communicate good practices on gender-responsive and Indigenous Peoples-led planning and budgeting** in the context of a just transition and conduct studies on a gender-responsive approach to integrated action on climate change and biodiversity loss. Support the development of evidence-based methodologies, including sex, disability, and age-disaggregated data and standard indicators, which are linked to related ecological indicators to assess gender equality.
- **Invest in women and Indigenous Peoples-led efforts, sectors, and collaborations** to facilitate existing and new efforts toward an integrated approach aimed at building the resilience of the social, climate, and economic resilience of the most vulnerable populations including through expanding access to gender-responsive social protections in all levels of Rio Convention associated policy and implementation.

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ANNEX 1

Potential Mitigation Benefits as Documented in the Contributions for Nature Platform

Contributions in the CfN documented to date highlight the significance of agroforestry, often in combination with other interventions such as natural regeneration, or mangrove restoration. These combined efforts encompass 2.1 million hectares and potentially sequester 44.8 million tonnes of CO_2, showcasing the potential synergy between agricultural and forestry practices in addressing climate change.

Meanwhile, plantations-woodlots are the third most reported intervention, whether independently or in conjunction with other strategies. Despite covering relatively modest land areas, 1.9 million hectares, these interventions play a pivotal role in removing carbon from the atmosphere, potentially sequestering 44.3 million tonnes of CO_2. Importantly, plantation woodlots present challenges regarding permanence as well as issues of meeting the criteria for biodiversity enhancement central to an NbS. These factors must be carefully considered when developing the baseline and tracking implementation. Through work undertaken within the ENACT Partnership, efforts will be made to make sure accounting of mitigation resulting from plantation-woodlots meet the criteria of an NbS, meaning they would come with benefits of social well-being and biodiversity net gain assurances.

Mangrove plantation, Karwar, India © Bishnu Sarangi from Pixabay

While it is important to acknowledge that the forest landscape restoration contributions documented in the platform to date are limited in comparison to the global requirements for swift and substantial action, these contributions are inspiring examples of what can be achieved on the ground to address climate change, and offer valuable insights into tangible solutions.

Potential forest landscape restoration contributions towards climate change mitigation goals, as documented in the Contributions for Nature Platform[11]

In total, forest landscape restoration actions across 15.4 million hectares of land are reported, with 70% of their potential CO_2 sequestration generated by natural regeneration. The second most reported intervention is agroforestry, which in combination with natural regeneration, plantations-woodlots and mangrove restoration, contributing 20% to the total potential CO_2 sequestration documented. The third most frequently documented forest landscape restoration intervention is the plantations-woodlots, which contribute around 10% of the total potential CO_2 sequestration documented, often in combination with natural regeneration and agroforestry.

With the qualification that the currently available data is not verified for permanence and NbS-alinged criteria of human well-being, the specific extents and potential CO_2 sequestration of the range of forest landscape restoration types documented in the platform are:

- Agroforestry: Approximately 0.16 million hectares of land are documented as under restoration, potentially sequestering approximately 1.78 million tonnes of CO_2.
- Agroforestry & Natural Regeneration: A more extensive restoration effort covering 0.33 million hectares has the potential to sequester approximately 6.22 million tonnes of CO_2.
- Agroforestry, Natural Regeneration & Mangrove Tree Restoration: This combined approach has resulted in forest landscape restoration across 0.69 million hectares, potentially sequestering 12.9 million tonnes of CO_2.
- Agroforestry, Natural Regeneration & Plantations-Woodlots: Over 0.89 million hectares are under restoration through this approach, leading to the potential sequestration of approximately 22.11 million tonnes of CO_2.
- Agroforestry & Plantations-Woodlots: A smaller area reported covering 0.06 million hectares, with a potential carbon sequestration impact of around 1.81 million tonnes of CO_2.
- Natural Regeneration: Dominating the efforts, this approach is undertaking restoration across a substantial 12.26 million hectares, potentially contributing significantly to carbon sequestration, estimated at 152 million tonnes.
- Natural Regeneration & Mangrove Tree Restoration: Covering 0.017 million hectares and potentially sequestering 0.18 million tonnes of CO_2.
- Natural Regeneration & Plantations-Woodlots: Approximately 0.49 million hectares are under restoration, leading to around 10 million tonnes of potential CO_2 sequestration.
- Plantations-Woodlots: Restoring 0.43 million hectares and potentially sequestering approximately 10.37 million tonnes of CO_2.

The calculations presented in this section represent the subset of FLR entries reported in the CfN database.

ANNEX 1

Regional variation in potential forest landscape restoration contributions towards climate change mitigation goals, as documented in the Contributions for Nature Platform:

Asia: an area of 0.13 million hectares is reported to be under restoration, with the potential to sequester 1.76 million tonnes of CO_2. Natural regeneration initiatives are underway across 0.1 million hectares, potentially sequestering 1.2 million tonnes of CO_2. The combination of natural regeneration and plantations/woodlots, spanning 4,972 hectares, has the potential to contribute 91,528 tonnes of carbon sequestration. Furthermore, plantations and woodlots encompassing 0.025 million hectares have the potential to sequester 0.47 million tonnes of CO_2 in this region. Considering forest landscape restoration contributions documented in two specific Asian countries:

- India: With 318.55 hectares, contributions documented in India have the potential to sequester 3,270 tonnes of CO_2 primarily through natural regeneration.
- Japan: covering 0.1 million hectares, forest landscape restoration documented in Japan has the potential to sequester 1.28 million tonnes of CO_2. Most of this sequestration is attributed to natural regeneration, although a small portion comes from a combination of natural regeneration and plantations-woodlots.

Eastern and Southern Africa: Madagascar is the only country in the region within which forest landscape restoration actions have been reported to date, with these covering 57,239 hectares and potentially sequestering 715,662 tonnes of CO_2. Agroforestry practices are noticeable here, with 41,024 hectares under restoration, often in combination with natural regeneration, potentially sequestering 436,219 tonnes of CO_2.

Mediterranean: Spain is the only country in the Mediterranean region within which forest landscape restoration actions have been reported to date. Contributions totaling 0.15 million hectares were reported to be under natural regeneration, potentially sequestering 1.53 million tonnes of CO_2.

Mexico, Central America, and the Caribbean: Forest landscape restoration documented as underway in this region covers a substantial area of 2.9 million hectares and potentially sequesters 58.26 million tonnes of CO_2. Agroforestry combined with natural regeneration and other practices is prominent here, emphasising the role of diverse intervention strategies in carbon sequestration. Considering specific countries across the region:

- Belize: With 24,598 hectares of forest landscape restoration documented, contributions in Belize potentially sequester 601,163 tonnes of CO_2 through natural regeneration and plantations-woodlots.
- Costa Rica: Covering 11,698 hectares, forest landscape restoration documented in Costa Rica potentially sequesters 275,235 tonnes of CO_2. Forest landscape restoration practices include agroforestry and a combination of agroforestry and plantations-woodlots.
- Dominican Republic: Forest landscape restoration contributions documented in the Dominican Republic, cover 0.19 million hectares, potentially sequestering 2.2 million tonnes of CO_2. This sequestration occurs through natural regeneration and a small portion through plantations-woodlots.
- Guatemala: With 0.4 million hectares, forest landscape restoration documented in Guatemala contributes 9 million tonnes of CO_2. This sequestration results from various practices, including agroforestry, natural regeneration, plantations-woodlots, and more.

- Honduras: Forest landscape restoration contributions documented in Honduras, with 2.033 million hectares, potentially sequester 42 million tonnes of CO_2. This sequestration is primarily attributed to agroforestry, mangrove-tree restoration and natural regeneration.
- Haiti: Covering 17,611 hectares, forest landscape restoration documented in Haiti potentially sequester 187,498 tonnes of CO_2 through mangrove-tree restoration and natural regeneration practices.
- Mexico: Mexico's 0.14 million hectares of forest landscape restoration documented potentially sequester 1.5 million tonnes of CO_2, with all sequestration attributed to natural regeneration practices.
- Puerto Rico: With 312 hectares, forest landscape restoration documented in Puerto Rico potentially sequester 3,527 tonnes of CO_2, primarily through natural regeneration practices.

North America: With 54,559 hectares of forest landscape restoration documented from Canada, contributions documented to date reveal potential sequestration of 1 million tonnes of CO_2. Natural regeneration and plantations-woodlots are the main contributors to carbon sequestration in this region, indicating the importance of forest management practices.

South America: Forest landscape restoration contributions documented in the region to date cover 7 million hectares, potentially sequestering 129 million tonnes of CO_2. Natural regeneration is the dominant strategy reported in this region. Agroforestry and plantations-woodlots also play substantial roles in this region. Considering some of the region's countries:

- Ecuador: With 26,092 hectares of forest landscape restoration documented, contributions in Ecuador potentially sequester 625,164 tonnes of CO_2 through agroforestry, natural regeneration, and plantations-woodlots.
- Peru: Covering 1.85 million hectares, forest landscape restoration documented in Peru potentially sequesters 34.6 million tonnes of CO_2, primarily through natural regeneration practices.
- Uruguay: Uruguay's 33,740 hectares of forest landscape restoration documented potentially sequester 630,933 tonnes of CO_2, primarily through natural regeneration practices.

West and Central Africa: Encompassing 4.94 million hectares of forest landscape restoration documented, this region potentially sequesters 24.75 million tonnes of CO_2. Natural regeneration is the primary method of carbon sequestration, with agroforestry and plantations-woodlots playing secondary roles. Considering specific countries within the region:

- Democratic Republic of the Congo: With 0.12 million hectares of forest landscape restoration documented, contributions in the Democratic Republic of the Congo potentially sequester 1.3 million tonnes of CO_2 through agroforestry practices.
- Mauritania: Covering 85,314 hectares, forest landscape restoration documented in Mauritania potentially sequester 281,537 tonnes of CO_2 primarily through natural regeneration.
- Niger: With 0.36 million hectares of forest landscape restoration documented, contributions in Niger contribute 8.72 million tonnes of CO_2 through plantations-woodlots.

Regional variation in threat abatement contributions towards biodiversity goals, as documented in the Contributions for Nature Platform

Given the enormous variability in biodiversity around the world, the average potential conservation gain that could be achieved in a given contribution differs from region to region across the 9854 contributions in the platform. Figure 7 shows the average STAR threat abatement score in a contribution across regions, that is, the average amount of global conservation gain that could be achieved by acting to reduce threats to species in the place in question. Drawing from the set of contributions currently documented in the platform, despite having the smallest number of contributions logged so far, projects in Africa have the greatest relative opportunity for reducing global species extinction risk.

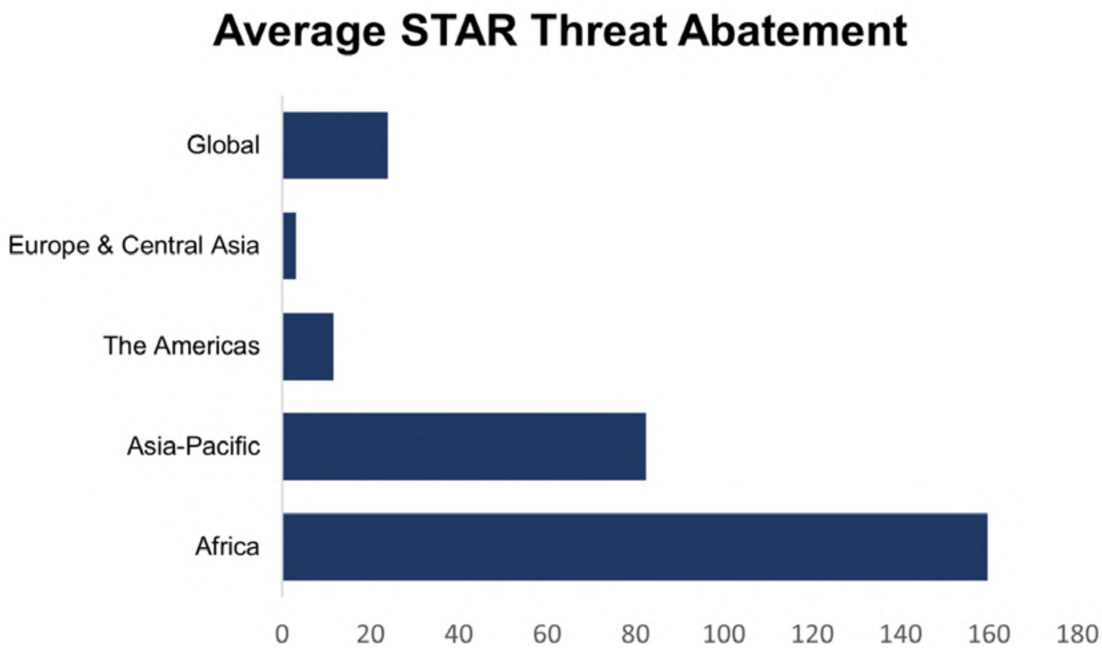

Figure 7: Average STAR threat abatement score in a given contribution by region.

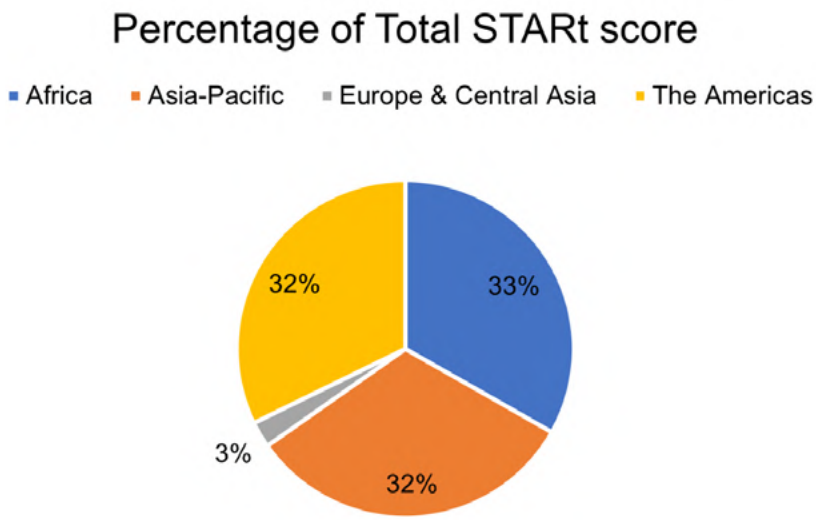

Figure 8: Distribution across regions of the total STAR threat abatement score of contributions documented to date.

Looking not at the average of individual contributions, but aggregating across all the contributions so far documented in the platform, Figure 8 shows that the contributions in Europe & Central Asia represent 3% of the threat abatement opportunity, Asia-Pacific and the Americas 32% each, and Africa 33%. This global geographic context emphasizes the importance of global monitoring and accounting across factors of ecological and human well-being that allow decision making which accounts for historic inequality in ecological impact and resource use.

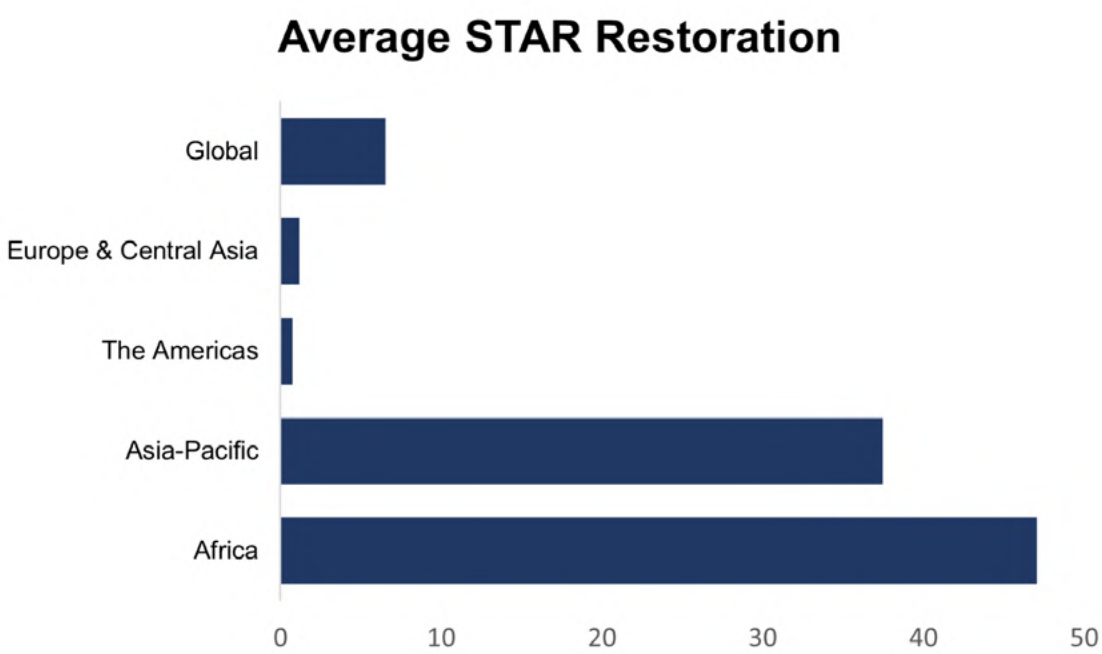

Figure 9: Distribution across regions of the total STAR threat abatement score of contributions documented to date.

Regional variation in restoration contributions towards biodiversity goals, as documented in the Contributions for Nature Platform

Turning from threat abatement actions to restoration, Figure 5 shows the average STAR restoration score in a contribution across regions, that is the average amount of global conservation gain that could be achieved by restoring species habitat in a given place. Again there is relatively less opportunity from restoration in the global north, with the Asia-Pacific and Africa regions having relatively much higher average STAR restoration scores in any given contribution. Investments and actions following this conclusion would be well guided by the criteria of NbS to assure human well-being is maximized.

Aggregating across all the contributions in the platform, Figure 9 shows that the contributions in Europe & Central Asia represent 4% of the restoration opportunity, the Americas 7%, Africa 36%, and Asia-Pacific 53%.

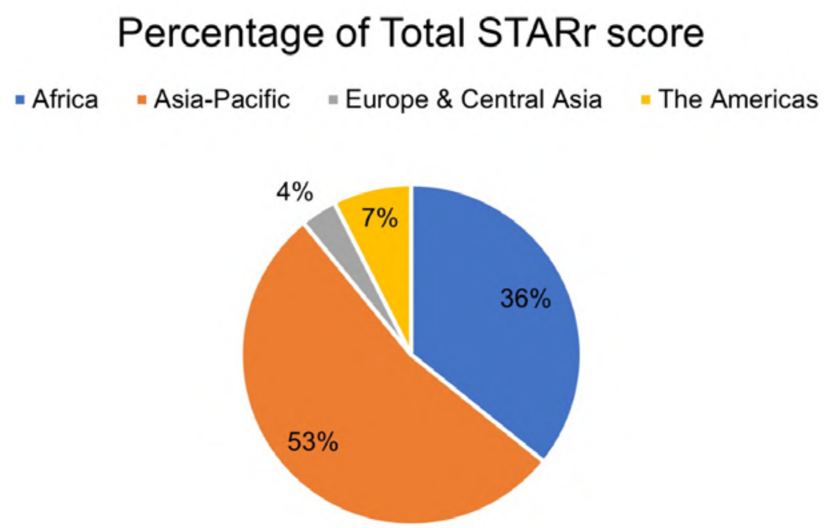

Figure 10: Distribution across regions of the total STAR restoration score of contributions documented to date.

ANNEX 1

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