POWERING NATURE: CREATING THE CONDITIONS TO ENABLE NATURE-BASED SOLUTIONS

SEPTEMBER 2021

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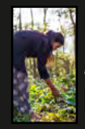
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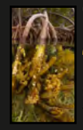
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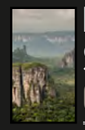
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CASE STUDIES

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FOREWORD

Nature is in freefall. Humanity's addiction to burning fossil fuels and converting natural ecosystems for agriculture is changing the climate, degrading once-productive lands and driving plant and animal species to extinction. It's no coincidence that millions of people each year are killed by the direct consequences of poverty, lack of clean water or adequate nutrition, extreme weather and exposure to new virulent pests and diseases.

Centuries of overexploitation has allowed a sense that humanity is somehow distant and disconnected from nature; when in reality we are deeply dependent on nature's health to safeguard our own. It's not appropriate to think of nature as just a provider of services, a tool to be utilised and discarded at will. Rather it is time we recognise nature as the ally that she has always been. As well as an appreciation of the power of nature, we now have a better understanding of *how* to unleash that power through an extremely powerful concept: nature-based solutions. In particular, the importance of an integrated social and economic policy framework for implementing nature-based solutions effectively, equitably and at-scale.

In many parts of the world intact natural ecosystems both sustain and protect the indigenous communities that inhabit them. Working with nature to build resilience against challenges to human well-being, or even survival, is not new. That wisdom is as old as time but is being sidelined, devalued or erased from memory in humanity's race to expand and dominate.

Nature-based solutions recall that age-old wisdom and reimagine it for the unprecedented challenges we face in the 21st century. Protecting, restoring and enhancing natural ecosystems holds the potential to help alleviate current societal challenges, including climate change, water and food insecurity, and to increase resilience to future risks. Grasping the inherent sense in resetting global development pathways along nature-positive[1] lines not only represents a cost-effective investment to the immense and immediate challenges society faces, but also encapsulates a vision for a better, healthier and safer world for all.

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1 Nature-positive refers to the need to halt and reverse nature loss measured from a baseline of 2020, through increasing the health, abundance, diversity and resilience of species, populations and ecosystems so that by 2030 nature is visibly and measurably on the path of recovery. See the Nature-Positive Coalition: https://www.naturepositive.org/.

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A SYSTEMIC ENABLING FRAMEWORK TO POWER NATURE-BASED SOLUTIONS

Authors: *Vanessa Pérez-Cirera, Stephen Cornelius, Jessica Zapata and Roz Pidcock*

Nature and human well-being are inextricably linked. The world's natural ecosystems are a source of food, water and clean air, as well as contributing to recreational, spiritual and religious well-being[2]. But human actions in recent decades and our failure to appropriately value nature has triggered unprecedented environmental degradation. For example, human activities directly affect more than 70 per cent of the Earth's ice-free land surface[3] and have caused global oceans to warm, acidify at the surface and lose oxygen[4]. In turn, human-caused environmental damage diminishes the capability of nature to provide vital services today and in the future.

2 Alcamo, J. et al. 2003. *Ecosystems and human well-being: a framework for assessment*. Millennium Ecosystem Assessment, United Nations Environment Programme. USA 236pp.

3 Intergovernmental Panel on Climate Change. 2019. Summary for Policymakers. *In: Climate Change and Land: an IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems*. 36pp.

4 Intergovernmental Panel on Climate Change. 2019. Summary for Policymakers. In: *IPCC Special Report on the Ocean and Cryosphere in a Changing Climate*. 35pp.

The world needs a new, smarter way of thinking and acting. For a sustainable future we need to address three intertwined global crises: biodiversity loss, climate change and equitable development[5]. We need solutions that are smart and effective at simultaneously tackling these and their associated societal challenges (see Box 1). We need a fundamental societal reset and nature-based solutions are an important part of it.

This systemic enabling framework is informed by the evidence and ideas in the following 10 chapters to unleash the power of nature to help solve key societal challenges at local to global scales, while maximising its positive nature-people-climate contribution. By identifying structural barriers, policy levers and systemic enablers, this report provides governments, decision-makers, civil society and the private sector with a practical basis for integrating nature-based solutions into planning decisions at different scales and in multiple sectors.

The concept: Enhancing nature to provide sustained human well-being

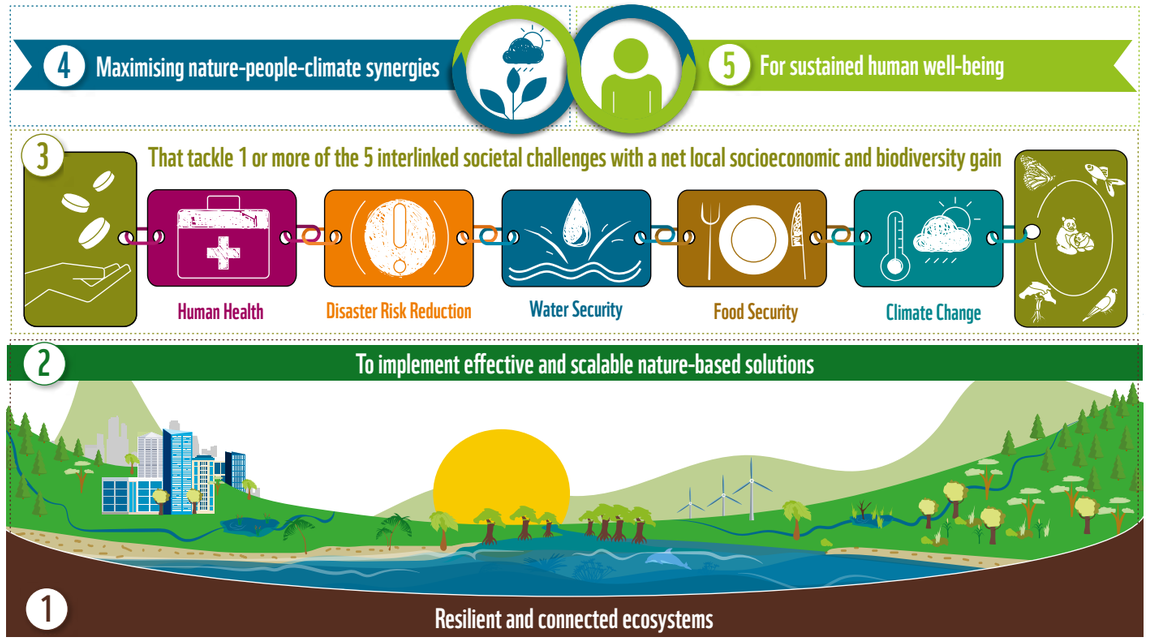
Nature-based solutions (see Box 2) comprise a broad set of responses that protect, restore or proactively manage landscapes, seascapes, watersheds and city corridors in a way that the societal services they provide can be maximised[6]. From protecting salt marshes to restoring forest habitats to sustainable watershed management, nature-based solutions are already in operation in different parts of the world, at different scales and in different sectors.

Five of the world's most pressing societal challenges are: 1. mitigating and adapting to climate change, 2. disaster risk reduction, 3. enhancing human health, 4. ensuring food security and 5. safeguarding access to clean water (see Box 1).

The first thing to recognise is that nature-based solutions are context-specific. They tackle one or more societal challenges and need to be tailored to the local environment. But they are also scalable to the landscape or regional level, thus amplifying their effectiveness. Importantly, nature-based solutions must be designed with Indigenous peoples and local communities (IPLCs) and carry benefits that are distributed equitably.

In addition to tackling societal challenges, the result of any nature-based solution must deliver both a net socioeconomic benefit at the local level (where the intervention takes place) and a net biodiversity gain (see Box 2. for additional considerations). These co-benefits, the societal challenge outcomes and the enhanced ecosystems will result in sustained human well-being (Figure 1).

Figure 1. *Nature-based solutions protect, restore or manage nature in ways that help tackle key societal challenges, while maximising nature-people-climate synergies.*



5 This concept is the "Triple Challenge" as captured in Baldwin-Cantello, W. et al. 2020, Triple Challenge: synergies, trade-offs and integrated responses to meet our food, climate and biodiversity goals. WWF-UK.

6 Understood as a connected urban environment.

BOX 1. FIVE SOCIETAL CHALLENGES THAT CAN BE ADDRESSED BY NATURE-BASED SOLUTIONS

Protecting human health – The pressure we put on ecosystems through the destruction of habitats or the consumption and commercialization of wild species facilitates the transfer of diseases to humans that would not otherwise occur[7], as evidenced in the COVID-19 pandemic.

Disaster risk reduction – Climate-related disasters (including those triggered by climate change) are increasing in frequency[8] and impact on people, nature and the economy[9]. This is due to an increase in people and assets exposed, climate change and loss of natural protection infrastructure (such as mangroves or wetlands)[10].

Safeguarding access to clean water – Nearly 3.6 billion people around the world experience water scarcity at least one month per year and around 2 billion are expected to be added by 2050[11], most of them in Asia. Demand is increasing at the same time that water availability is decreasing due to climate change, transformation of ecosystems (such as wetlands or floodplains), and pollution[12].

Ensuring food security – Feeding 7.8 billion people today and around 10 billion people by 2050 is a challenging task. Under current production practices and consumption trends the world won't be able to sustainably supply the food needed in 2050[13,14].

Mitigating and adapting to climate change – human-induced climate change is the result of centuries of unsustainable exploitation of natural resources (mainly fossil fuels) and transformation of land/seascapes.

BOX 2. NATURE-BASED SOLUTIONS DEFINITION AND KEY CONSIDERATIONS

This report embraces the definition of nature-based solutions put forward by the International Union for Conservation of Nature (IUCN) as: *"actions to protect, sustainably manage, and restore natural or modified ecosystems, that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits"*[15] with the enhancements in conceptualization, effective implementation and scaling provided by this report (summarised in Figures 1-3 of this systemic enabling framework).

We also embrace the University of Oxford guidelines for Nature-based Solutions to Climate Change[16] especially the principle that nature-based solution are not a substitute for the necessary rapid phase-out of fossil fuels and that private investments in high-quality nature-based solutions must happen above and beyond an a Science Based Targets initiative (SBTi) validated 1.5˚C aligned target, as explained in WWF´´s Blueprint for Corporate Leadership in Climate and Nature[17].

Some illustrative examples[18] of nature-based solution include:

Restoration of wetlands in a city to improve surface water flows and reduce the risk of flooding.	Agreements for the protection of spawning areas and fishing sizes between community organisations to ensure the livelihoods provided by sustainable fishing.	National / subnational governments investing in forest restoration for carbon sequestration under jurisdictional approaches and the subsequent generation of decent jobs	A farmer shifting from an unshaded coffee plantation affected by pests due to the increase in temperature, to a diversified cropping system implemented under a climate-smart agroecological production approach

7 World Wildlife Fund. 2020. Nature and pandemics. *What causes a pandemic like COVID-19, and why is protecting nature fundamental to reducing the risk of future outbreaks?* https://www.wwf.org.uk/nature-and-pandemics. Accessed 25 Aug 2021.

8 International Federation of Red Cross and Red Crescent Societies. 2020. *World Disasters Report 2020.* Executive summary. Geneva, Switzerland. 17pp.

9 Buchholz, K. 2020. *This chart shows how much more common natural disasters are becoming.* World Economic Forum. https://www.weforum.org/agenda/2020/09/natural-disasters-global-risks-2019. Accessed 25 Aug 2021.

10 Dominey-Howes, D. 2015. *Explainer: are natural disasters on the rise?*. The conversation. https://theconversation.com/explainer-are-natural-disasters-on-the-rise-39232. Accessed 25 Aug 2021.

11 World Water Assessment Programme. 2018. *The United Nations World Water Development Report 2018: Nature-Based Solutions for Water*. United Nations Educational, Scientific and Cultural Organization. Paris, France. 139pp.

12 Boretti, A. and Rosa, L. 2019. *Reassessing the projections of the World Water Development Report*. npj Clean Water 2, 15. https://doi.org/10.1038/s41545-019-0039-9

13 Willett, W. et al. 2019. *Food in the Anthropocene: the EAT–Lancet Commission on healthy diets from sustainable food systems*. The Lancet Commission 339: 447-492. https://doi.org/10.1016/S0140-6736(18)31788-4.

14 Searchinger, T. et al. 2018. *Creating a sustainable food future. A Menu of Solutions to Feed Nearly 10 Billion People by 2050*. WRI, The World Bank, UNEP & UNDP. Washington, DC, USA. 556pp.

15 For additional information please refer to: https://www.iucn.org/theme/nature-based-solutions/about

16 University of Oxford, et al. (2021) *Guidelines for Nature-based Solutions to Climate Change*. https://nbsguidelines.info/. Accessed 26 Aug 2021

17 World Wildlife Fund and Boston Consulting Group. (2020.) *Beyond Science-Based Targets: A Blueprint for Corporate Action on Climate and Nature*. 19pp

18 This is not an exhaustive list of nature-based solutions. For additional inspiring examples please refer to:
1. Cornelius, S. (ed). 2019. *Climate, Nature and our 1.5°C Future. A synthesis of IPCC and IPBES reports*. WWF International. Gland, Switzerland. 39pp.
2. Lieuw-Kie-Song, M., & Perez-Cirera, V. (2020). *Nature hires: how nature-based solutions can power a green jobs recovery*. WWF-ILO.

The practical case: Investing in nature's support systems

If effectively embedded within progress towards sustainable development, nature-based solutions can be a durable and scalable way to address societal challenges, reverse the downward trend in biodiversity and enhance equitable human well-being[19].

Taking a nature-positive approach to transforming food systems catalyses the shift to more sustainable, productive lands. Rehabilitating degraded agricultural land and sustainably managing existing productive lands generates societal benefits in terms of higher crop yields, better nutritional quality and greater food security at local and global levels. There are also long-term benefits for the climate since healthy ecosystems sequester more carbon (see Chapter 1).

Maintaining 'ecological corridors', when roads and other infrastructure is built or when agricultural land is expanded, can reduce resource competition between animals and humans and allows processes upon which we depend to continue undisturbed, such as pollination. At a local level, community-managed connectivity projects could even bring in revenue through ecotourism. A well-planned scaling up of connected landscapes preserves migratory routes that cross countries and continents and allows vulnerable species to find refuge in a warming climate (see Chapter 2).

In river systems worldwide – including the Mississippi, Rhine, Yangtze and Sacramento rivers – floodplains are being reconnected and allowed to flood, rather than relying solely on engineered structures such as dams, dikes and floodwalls[20]. The societal benefits of a 'diversified portfolio' approach to managing flood risk come in the form of avoided damages and associated costs as our changing climate leads to more extreme weather. Biodiversity is enhanced through the restoration of floodplain ecosystems, which are among the most productive in the world (see Chapter 3).

Around the world, low-lying small islands and coastal areas are demonstrating the value of protecting 'green infrastructure' for increasing resilience to flooding and coastal erosion. Maintaining and restoring coastal forests, wetlands and mangroves complements engineered 'grey infrastructure' and can provide protection at lower cost, while delivering additional long-term societal and environmental benefits. These include sequestering carbon and preserving important spawning grounds and nurseries for fish and shellfish upon which local livelihoods depend (see Chapter 4).

A smart approach to nature-based solutions builds in resilience to different possible futures in a changing climate. Assessing the risk to specific activities posed by climate change (e.g. investment decisions based on how the protection of restored mangroves may diminish with rising seas) and working with local communities to ensure activities do not inadvertently exacerbate vulnerability to climate change ensure the benefits are sustained for decades to come (see Chapter 5).

Engaging IPLCs in the design, implementation and scale up of nature-based solutions is another critical element to ensure their long-term viability. Respecting local communities' cultural and ecological rights to the land and co-designing projects such that they are suited to the specific environment and rooted in the values and norms of the people who live and work there will help to ensure permanent, positive outcomes (see Chapter 6).

Unleashing the full potential of nature-based solutions will require a significant shift in the mindset of public and private investors. Alongside new financial mechanisms and incentives, this will involve: redirection of financial flows away from activities that undermine ecosystems; better understanding of the value and benefit structure of nature-based solutions (including avoided costs); and new ways to mobilise private capital towards nature-positive practices (see Chapter 7).

A key tool for decision-makers at any level is the ability to monitor the performance of a policy intervention to ensure it is creating the expected benefits, to fully understand any trade-offs and to avoid unintended (collateral) effects. This report proposes a set of field-based indicators to generate quantifiable data about the social and environmental impact of nature-based solutions, to support policymakers in selecting the most effective solution to a societal challenge (see Chapter 8).

A number of countries around the world offer tangible case studies for how to effectively implement and scale up nature-based solutions. The Colombian government has drawn up a comprehensive national policy framework that recognises the potential of nature-based solutions to accelerate the country's green development path as well as achieving efficiency in public spending. Malaysia has established several policies and enacted legislation to maintain at least 50 per cent of the country's land mass under forest and tree cover, enabling the private sector and civil society to advance the implementation of nature-based solutions across Malaysia at a landscape level. (see Chapter 9).

International Environmental Conventions and their Agreements over the past few decades have addressed specific issues, but remain too fragmented to reflect the intertwined and connected societal challenges that the world faces today or the potential that nature-based solutions have to offer. A coordinated policy approach under a set of principles is needed that integrates and aligns nature-based solutions across UN Conventions and within governments (see Chapter 10).

Despite a clear understanding of the power of nature-based solutions, there has been insufficient action by policymakers, corporate institutions and financial bodies to maximise its potential. Factors that led to the destruction of nature in the past are still obstacles to nature being part of the solution to today's challenges. What worked in the past will no longer suffice – an urgent policy reset is needed.

19 Seddon, N. et al. 2020. *Understanding the value and limits of nature-based solutions to climate change and other global challenges*. Phil. Trans. R. Soc. B 375: 20190120. http://dx.doi.org/10.1098/rstb.2019.0120

20 Opperman, J.et al. 2017. *Floodplains: Processes and management for ecosystem services*. University of California Press. 280pp.

The smart way forward: A systemic enabling framework

This report proposes a systemic enabling framework to effectively implement, scale up and mainstream nature-based solutions. Given their importance and viability for change, we focus on three categories of structural barriers – sociocultural, institutional and economic (see Figure 2). We then present a set of policy levers that are available to decision-makers to overcome these barriers, organised around three overarching categories of systemic enablers: inclusive governance, smart planning and progressive economic and financial regulation (see Figure 3). Together, action in these three areas represents an important step towards an integrated whole-of-government approach to social and economic policy[21], which is the most effective way to power nature-based solutions.

Structural barriers

SOCIOCULTURAL

These refer to barriers related to the behaviors of different actors required for scaling nature-based solutions:

1. **Insufficient recognition of rights:** Many IPLCs lack certainty with regards to their rights to land or sea, and face legal and institutional barriers that prevent them from making decisions about how to plan, organise and monitor resources. This can be compounded by unclear and/or competing land uses, primarily agriculture, infrastructure and urban uses.

2. **Missing social incentives:** Nature held under common property schemes[22] can incur congestion, overuse or degradation yet many local governance mechanisms require reinforcement or specific policy support to exclude other potential uses. However, evidence countering Hardin's 'Tragedy of the Commons' hypothesis shows that when appropriate institutional arrangements and/or policy frameworks exist or are devised, individual users will act in the common good rather than their self interest[23].

INSTITUTIONAL

These refer to barriers related to the rules and conventions required for the effective governance of nature-based solutions:

3. **Conflicting policy frameworks:** Policies in different sectors may not be aligned or may even clash in their objectives, such as water-rights allocations that do not allow for the environmental flows required to sustain freshwater and estuarine ecosystems. Misalignment of policy frameworks can run all the way up to the international level (including international trade agreements versus sustainable development goals).

4. **Limited government capacity and corruption:** There can be limited technical and administrative capacities as well as disparity in power between national and sub-national levels[24]. This includes low law-enforcement capacity for appropriate monitoring and penalization of illegal activities (e.g. illegal logging) and, for some nations, corruption. All of which works against the effective implementation and scaling of nature-based solutions[25].

ECONOMIC

These refer to barriers related to the effective funding and incentivising of nature-based solutions:

5. **Undervaluing natural capital:** GDP, which continues to be the main measure of progress/development, does not consider the depletion of natural resources nor does it consider the positive flow of sustainable interventions or capture the negative externalities generated by our current ways of producing, consuming and measuring success.

6. **Insufficient or poorly directed finance:** Current levels of targeted public and private funding for nature-based solutions are insufficient. Roughly US$133 billion a year flows into nature-based solutions, exposing a funding gap of an estimated US$4.1 trillion by 2050.[26] Governments are also spending large amounts on subsidies for different sectors, many of which are environmentally harmful[27].

7. **Limited direct financial revenues:** Benefits that ripple from nature-based solutions are distributed at different levels and between many stakeholders, making 'revenue streams' indirect or limited from an investor's point of view. The lack of standardised metrics of societal and environmental performance also make it difficult to properly compensate stewards for the societal benefits generated by implementing nature-based solutions.

Finally, technologies such as remote sensing, thermal imaging and drones can be important for improving understanding of nature's value to people[28] and monitoring the effectiveness of nature-based solutions. **Technological barriers,** which are not the focus of this report, might arise when the access to such technologies, or the capacity to use them, is not available evenly between different regions of the world or stakeholders.

21 Dauvergne, P. (ed). 2014. *Handbook of Global Environmental Politics* (2nd ed). Edward Elgar Publishing. Cheltenham, UK. 560pp.

22 Common property belongs to everyone in a given community or the public in general.

23 Ostrom, E. 1990. *Governing the Commons: The Evolution of Institutions for Collective Action*. Cambridge University Press. Cambridge, UK. 280pp.

24 Di Gregorio, M. et al. 2019. *Multi-level Governance and Power in Climate Change Policy Networks*. Global Environmental Change, 54: 64-77. https://doi.org/10.1016/j.gloenvcha.2018.10.003.

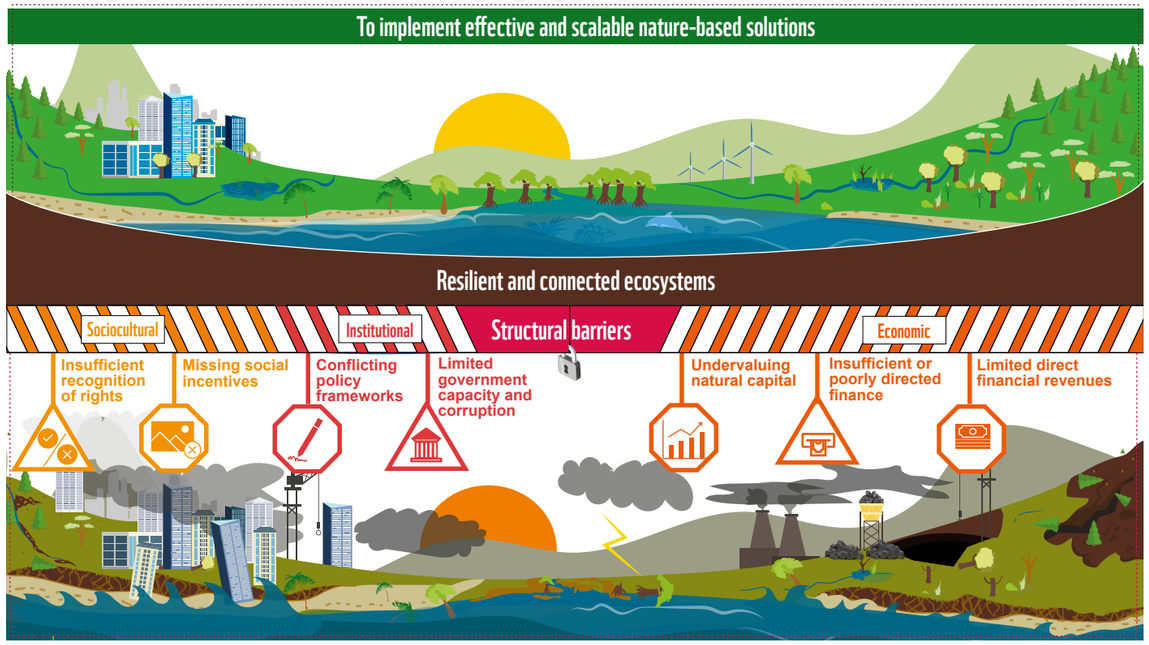
25 Tacconi, L. and Williams, D. 2020. *Corruption and Anti-Corruption in Environmental and Resource Management. Annual Review of Environment and Resources*, 45:305-329. https://doi.org/10.1146/annurev-environ-012320-083949.

26 United Nations Environment Programme. 2021. *State of Finance for Nature* 2021. Nairobi, Kenia. 60pp.

27 OECD countries are estimated to spend as much as US$ 500 billion annually on subsidies (1), in contrast to the US$ 0.89 billion per year spent in biodiversity positive subsidies (2), as stated in:
(1) Organisation for Economic Cooperation and Development. 2019. *Biodiversity: Finance and the Economic and Business Case for Action*, report prepared for the G7 Environment Ministers' Meeting, 5-6 May 2019. 95pp.
(2) Dasgupta, P. 2021. *The Economics of Biodiversity: The Dasgupta Review*. HM Treasury. London: UK. 604pp.

28 Lambertini, M. 2018. *Technology can help us save the planet. But more than anything, we must learn to value nature*. World Economic Forum. https://www.weforum.org/agenda/2018/08/here-s-how-technology-can-help-us-save-the-planet/. Accessed 29 Aug 2021.

Figure 2. *Structural barriers to the effective implementation, scaling and mainstreaming of nature-based solutions.*



Policy levers and systemic enablers

INCLUSIVE GOVERNANCE

Leads to **enhanced social agency**. The ability or capacity of individuals, institutions or organisations to act or to have influence[29] helps build institutional structures based on co-responsibility rather than the pursuit of individual privileges[30].

1. **Legal rights** – Strengthening the capacity of IPLCs to exercise their rights and traditional stewardship over their land by recognising their claims to their territories, defending existing rights, participating in sub-national and national decision-making processes and having access to financial resources and technologies.

2. **Investing in local institutions** – A stable network of citizens, communities and local/regional organisations that generates trust and reduces asymmetries in access to information is fundamental for social acceptability and cooperation towards a common goal.

3. **Fair benefit sharing** – The multiple benefits a single nature-based solution can deliver at different scales and trade-offs exist between different uses of nature. Progessive income distribution requires a better understanding of the benefit flow.

SMART SPATIAL PLANNING

Leads to **resilient communities**. Taking into account the local context – now and in the future – ensures that nature-based solutions improve well-being at a local level.

4. **People-centred planning** – Designing and implementing nature-based solutions that have people front of mind, engage different stakeholders under a collective vision and are context-specific is key to ensuring the long-term sustainability of interventions.

5. **Ecological corridors** – Prioritising the scale-up of nature-based solutions in ecological corridors as part of land/water/seascape level planning; incorporating ecological connectivity data into spatial planning decision-making; and creating incentives for connectivity-related nature-based solutions.

6. **Climate-smarting interventions** – No-regrets investments require embedding a vulnerability assessment of ecosystems under different climate change scenarios in the design phase of nature-based solutions, as a prerequisite for the bilateral and multilateral agencies that fund them.

PROGRESSIVE ECONOMIC AND FINANCIAL REGULATION

Leads to **targeted funding and incentives.** Repurposing finance that drives unsustainable practices and coherence around public investments and private capital are necessary for effective nature-based solutions.

7. **Subsidy reform** – Removing subsidies that encourage overexploitation of nature is essential to truly achieve net benefits for people, biodiversity and climate. Public spending on subsidies should be reallocated to incentivise transitions to nature-positive practices.

8. **Natural capital accounting and beyond income measures** – Including natural capital in the way we

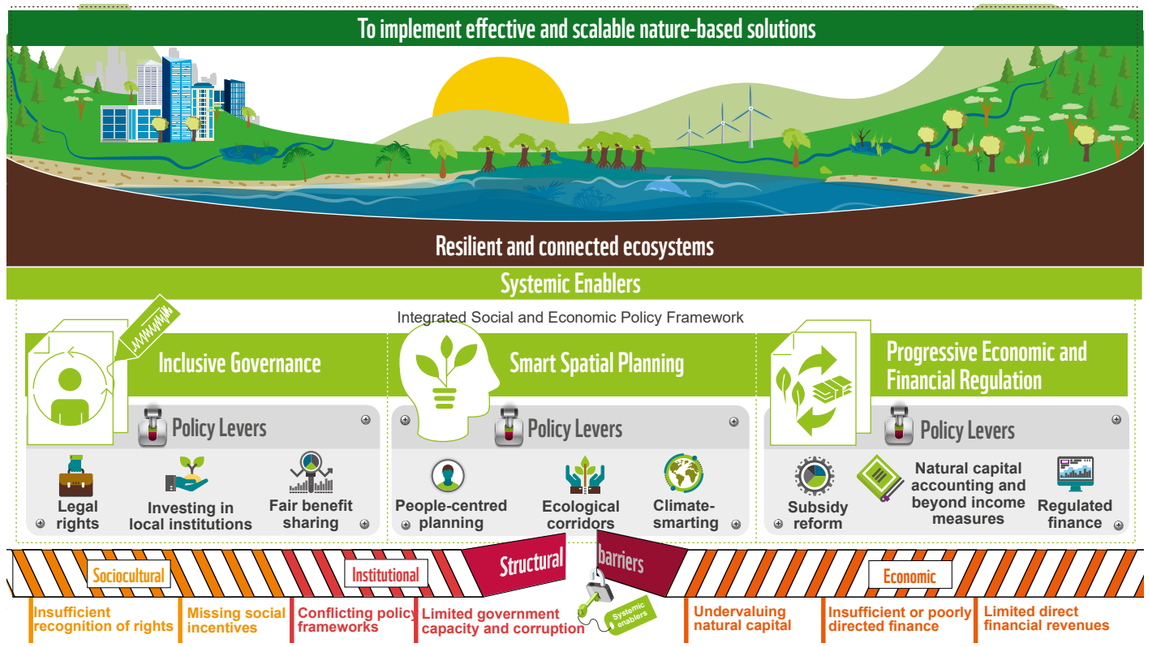
29 Trauger, A. 2009. *Social agency and networked spatial relations in sustainable agriculture*. Area, 41.2: 117–128. doi: 10.1111/j.1475-4762.2008.00866.x.

30 Redcliff, M. 2010. *The International Handbook of Environmental Sociology*. Edward Elgar Publishing. London, UK. 448pp.

measure well-being provides a better understanding of societal progress (e.g. by determining the monetary value of intact ecosystems as well as the value of restoring degraded ones and including the value in disaster risk reduction frameworks).

9. **Regulated finance** – Redistributive measures that incentivise sustainable practices are needed to provide a level playing field for businesses and investors and encourage a stronger flow of capital to nature-based solutions. These include changes in price allocation, behavioral norms, and aligning global supply chains with environmental objectives.

Figure 3. *The structural barriers to nature-based solutions are surmountable with an integrated set of policy levers.*

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SUMMARY RECOMMENDATIONS FOR POLICYMAKERS

Policy actions to **level the playing field** for businesses and investors by showing the true cost of unsustainable practices in the global market:

- Analyse the environmental impacts of domestic activities on different ecosystems (e.g. food production, infrastructure development, transport networks).
- Integrate hidden environmental costs into prices and financial risk assessments.
- Remove subsidies for activities that drive land conversion and harm nature from domestic financing plans and actively repurpose the funds (see financing below).
- Regulatory initiatives to remove habitat-converting produce from supply chains.

Policy actions to **incentivise and reward** nature-based solutions:

- Determine the monetary and non-monetary values of the ecosystem services provided by intact landscapes, seascapes, watersheds and city corridors (e.g. via carbon accounting and multi-criteria modelling).
- Ensure transparent and equitable benefit-sharing agreements are drawn up with the participation of Indigenous peoples and local communities.
- Provide advice, training, funding and/or market access to help start-ups to scale up their activities (i.e. business incubation platforms).
- De-risk credit for practitioners that adopt nature-positive practices (i.e. food producers).

Policy actions to **mobilise finance** behind nature-based solutions:

- Analyse the up front investment needed for nature-based solutions at the landscape level and make recommendations for the deployment of public and private funds.
- Provide access to capital to support the sustainable management or rehabilitation of ecosystems (i.e. green investment bonds, microfinance loans).
- Repurpose finance that currently drives the conversion of nature, including lending for land clearance and environmentally damaging subsidies (see above).
- Leverage additional and innovative sources of funding for nature-positive practices by facilitating collaborations across government, funders, sectors and practitioners.

Policy actions to **support the practical implementation** of nature-based solutions:

- Integrate nature-based solutions into the main budgets of social development and other cross-cutting ministries and facilitate their implementation across different economic sectors with a common and long-term vision.
- Mainstream nature-based solutions within national governance and climate policy-related instruments, including national development plans, Nationally-Determined Contributions, and Multilateral Agreements.
- Conduct a climate vulnerability assessment of target ecosystems in the design phase of project development.
- Regulate to protect and sustainably manage green and blue infrastructure (i.e. ecological corridors, floodplains) and prevent conversion into new production lands.
- Make the inclusion of local and traditional knowledge, ecosystem services information (i.e. ecological connectivity data) and a climate-vulnerability assessment prerequisites for spatial planning decision-making.
- Ensure Indigenous peoples and local communities have access to financial resources, technologies and decision-making processes, and remove discriminatory legal or institutional barriers.
- Require a diversified portfolio approach to managing risk from disasters (e.g. floods) that includes investment in ecosystems that mitigate the risk (i.e. wetlands, floodplains) alongside traditional engineered approaches.
- Require accurate valuations of ecosystem services and accounting methodologies for the systematic assessment of proposed changes in habitat use, including trade-offs and opportunities.
- Develop an inventory to showcase nature-based and hybrid solutions (combining engineered and nature-based solutions) as alternatives to traditional development and/or provide technical assistance to promote uptake of new technologies.
- Increase investment in monitoring the performance of nature-based solutions (e.g. via weather stations, tide gauges, satellite imagery); standardised social and environmental indicators; target-setting and clear and consistent disclosure.

There are more detailed recommendations for policy-makers, private institutions, and practitioners in the following 10 chapters.

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NATURE-BASED SOLUTIONS FOR THE TRANSFORMATION OF FOOD SYSTEMS

Authors: *Mike Barrett, Joao Campari and Peter McFeely*

The true cost of food

Where and how we produce food is one of the largest threats to biodiversity, ecosystems and climate. Nearly 40 per cent of all land is used for food production. Agriculture is responsible for 80 per cent of global deforestation and accounts for 70 per cent of freshwater use. Food systems have caused 70 per cent of biodiversity loss on land and 50 per cent in freshwater, and account for approximately 29 per cent of all greenhouse gas emissions.[31]

Although there are thousands of edible foods, we rely on just five animals and 12 plants for 75 per cent of our calories. This lack of diversity is understandably bad for nature, while it also makes food systems less resilient to pests and diseases. The production of much of these foods is resource-intensive, driving the degradation of ecosystems. For instance, 77 per cent of all agricultural land is used to raise or feed animals, but animal-sourced foods deliver just 18 per cent of all calories[32]. Many crops are grown in monocultures and with large amounts of irrigation, pesticides and chemical fertilizers. The over-consumption of these resource-intense foods, along with wastefulness, exacerbate unsustainable food production practices. Approximately 40 per cent of all food produced goes uneaten[33]. More than half of all farmland is degraded and underperforming[34], driving further conversion of nature to feed a growing population.

In addition to the indirect impacts on people caused by unsustainable food systems, the resulting degradation of nature and climate will directly affect our ability to nourish growing populations with healthy and nutritious diets. The combined effects of biodiversity loss and global warming are predicted to reduce crop yields[35] and nutritional density[36], threatening food security for hundreds of millions.

In total, while food consumed globally has a market value of US$9 trillion, external costs (not included in market prices) are estimated to be more than double that amount (around US$19 trillion). These externalities accrue from US$7 trillion in environmental costs, US$11 trillion in costs to human life and US$1 trillion in economic costs. This means that food is roughly a third of the true costs than it would be if these externalities were included in market pricing.[37]

Transformation of our food systems

Nature is in freefall, as the continued conversion of land for agriculture and over-exploitation of oceans and rivers drive the loss of habitat and species. It is necessary to transform our food systems, adopting nature-positive[38] food production practices that protect nature, sustainably manage existing productive lands and waters, and rehabilitate degraded ecosystems. Shifting to healthier, more sustainable diets and reducing food loss and waste will further enhance production efficiency, alleviating the pressure to convert nature, and reduce harmful greenhouse gas emissions. By farming with nature, rather than simply extracting from it, we can optimize all ecosystem services, including food production, to increase biodiversity and carbon sequestration.

The true costs of food production need to be reflected in prices, wages and financial valuations and we must promote foods which support healthy people and a healthy planet. If we do not take these steps, externalized environmental and health costs will continue to be imposed.

Nature-based solutions provide a crucial opportunity to restore high-priority landscapes and to catalyse the transition to sustainable, productive lands. We must begin to value intact ecosystems in economic planning and human health.

Defining high-priority landscapes

To meet the fundamental human right to healthy and nutritious food, within planetary boundaries, we need all food production to be nature-positive and for agriculture to become a carbon

31 Almond, R.E., Grooten M. and T. Petersen. (Eds). 2020. L*iving Planet Report 2020 - Bending the curve of biodiversity loss*. WWF, Gland, Switzerland. 159pp.

32 Mottet, A., et al. 2017. *Livestock: On our plates or eating at our table? A new analysis of the feed/food debate*. Global Food Security, 14: 1-8. https://doi.org/10.1016/j.gfs.2017.01.001.

33 World Wildlife Fund-UK. 2021. *Driven to waste: The Global Impact of Food Loss and Waste on Farms*. 23pp.

34 Almond, R.E., Grooten M. and T. Petersen, (Eds). 2020. Living Planet Report 2020 - Bending the curve of biodiversity loss. WWF, Gland, Switzerland. 159pp.

35 Wang, X., et al. 2020. *Emergent constraint on crop yield response to warmer temperature from field experiments*. Nat Sustain 3, 908–916. https://doi.org/10.1038/s41893-020-0569-7.

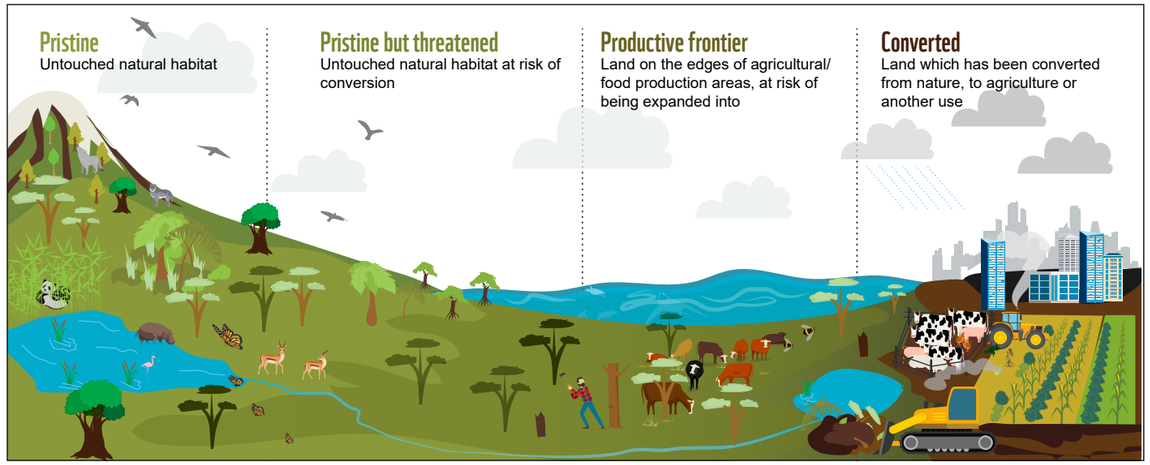
36 Smith, M., Thornton, P., and S. Myers. 2018. *The Impact Of Rising Carbon Dioxide Levels On Crop Nutrients And Human Health*. International Food Policy Research Institute: *Gender, Climate Change, and Nutrition Integration Initiative*, policy note 10. 4pp.

37 Hendriks, S. et al. 2021. *The true cost and true price of food*. Scientific Group of the United Nations Food Systems Summit. 41pp.

38 Nature-positive refers to the need to halt and reverse nature loss measured from a baseline of 2020, through increasing the health, abundance, diversity and resilience of species, populations and ecosystems so that by 2030 nature is visibly and measurably on the path of recovery. See the Nature-Positive Coalition: https://www.naturepositive.org/.

sink. As food systems around the world transition to sustainable production practices, including agroecology and regenerative agriculture, high-priority landscapes (and seascapes – see Chapter 4) that need to be protected, sustainably managed and restored can be identified. These are large areas consisting of mixed-use lands, including food production, natural areas, human settlements, and infrastructure. A landscape may include converted, frontier and pristine areas. Though action should continue to be encouraged at a local and individual level, addressing challenges at this scale ensures trade-offs are considered and allows for the fact that in some ecosystems some loss of nature may be necessary for local populations to prosper. Restoring these large land- and seascapes requires territorial intelligence and spatial planning, as well as a rights-based approach, to identify which elements of the ecosystem are to be protected, sustainably managed or restored.

Figure 1.1. *Types of areas in a landscape*



Driving investment in the transformation to nature-based food systems

Alongside efforts to protect and restore natural habitat, simultaneous actions are needed to promote sustainable investments, to offer positive incentives to food producers, and to transform commodity supply chains that benefit people and nature. This approach will ensure that the true costs of food production are captured in prices, wages and financial valuations, and that institutional market behaviours support conservation.

PROMOTING SUSTAINABLE INVESTMENTS

Emerging commitments to increase finance for nature-based solutions are a major opportunity to use official development assistance to create the conditions for large-scale, long-term change. For example, as part of their overall international climate spend, France has allocated 30 per cent of its budget and the UK has allocated GBP3 billion for spending on nature. It is necessary to encourage further commitments from the private and public sector, and to leverage these funds for systemic change rather than disparate conservation projects.

MAKING POSITIVE INCENTIVES AVAILABLE TO FOOD PRODUCERS

Of the US$600 billion of agri-food subsidies paid every year, just 5 per cent goes towards any kind of conservation outcome[39]. Subsidies which encourage unsustainable production practices must be removed, while incentives for nature-positive agriculture practices need to be increased – for instance, paying food producers, especially the under-privileged, for ecosystem services such as carbon sequestration or supporting biodiversity.

Food producers can be incentivised through the de-risking of credit for adopting nature-positive food production practices. An estimated 270 million smallholder farmers live in poverty because they lack the financial means to make their farms more profitable or more sustainable. Smallholders are further hampered by a combination of reluctance by financial institutions to invest in smallholders and high interest rates that make loans unaffordable to them, all due to perceived high risks (see Chapter 7)[40]. In addition to better access to finance, food producers will benefit from increased technical assistance (particularly for smallholders and artisanal fisherfolk) and improved access to, and affordability of, new technologies.

TRANSFORMING COMMODITY SUPPLY CHAINS

In addition to investing in protecting natural habitats, there must be concerted efforts to transform consumption and production. To achieve a nature-positive world, it is necessary to halve the footprint of production and consumption by 2030. Financial investments and incentives are just one part of the solution. This new money needs to be aligned with commensurate efforts to implement regulations and market mechanisms that value nature and penalise unsustainable production. By doing so, we can achieve conversion-free economies.

39 Searchinger, T., et al. 2020. *Revising Public Agricultural Support to Mitigate Climate Change*. The World Bank. Washington, DC, USA. 74pp.

40 The Sustainable Trade Initiative. 2021. *IDH Farmfit Fund invests in LendXS to jointly accelerate smallholder finance*. https://www.idhsustainabletrade.com/uploaded/2021/06/20210601_PressRelease_IDH-Farmfit-Fund-invests-in-LendXS_20210601.pdf. Accessed 24 Aug 2021.

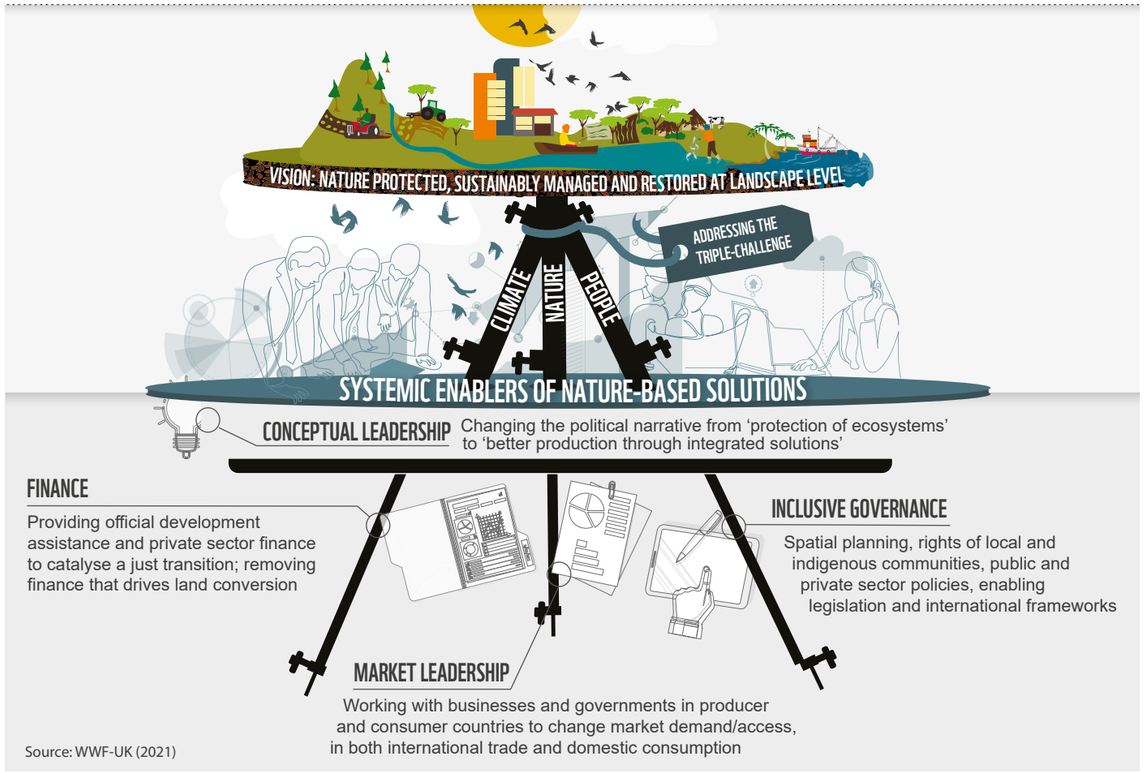
Pieces of the jigsaw

The following elements are prerequisites for conservation interventions that are necessary to restore landscapes:

- Changing the political narrative to one of integrated solutions, resulting in sustainable productive landscapes. This is similar to past efforts to shift from the narrative of slowing or halting loss (e.g. Aichi Target 5) to the aspiration for recovery (e.g. the 'Bending the Curve' modelling which tells us that reversing biodiversity loss requires a strategy that combines conservation with a shift to sustainable food production and consumption[41]).
- Changing market demand, so that unsustainably produced foods become undesirable, and rethinking trade policies so that only foods that are produced in a nature-positive way would enter the international market. Private sector commitments on taking deforestation out of supply chains have proved to be insufficient. Regulatory measures are required to provide a level playing field and to incentivise sustainable production – for instance, providing exclusive market access to nature-positive producers.
- Repurposing finance that drives land conversion (including lending for land clearance and environmentally damaging subsidies) to help support a just transition.
- Providing Official Development Assistance finance to accelerate change, particularly in providing near-term access to capital to support the rehabilitation of abandoned or degraded agricultural lands.
- Enacting regulations to combat rent-seeking behaviour. In many key landscapes, a lack of clear legislation, transparency or law enforcement can lead to land-grabbing and the exploitation of natural resources for rent, destroying natural capital.

Successfully protecting, sustainably managing and restoring landscapes requires a change of political narrative, and the delivery of three systemic enablers related to finance, market leadership and inclusive governance (See Figure 1.2).

Figure 1.2. *Systemic enablers of nature-based solutions: protect, sustainably manage and restore landscapes for nature-positive food production*



41 Leclère, D. et al. 2020. *Bending the curve of terrestrial biodiversity needs an integrated strategy*. Nature, 585: 551–556. https://doi.org/10.1038/s41586-020-2705-y

CASE STUDY - BRAZIL'S CERRADO

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Extending over 2 million square kilometres, Brazil's Cerrado is the oldest and most biodiverse savannah in the world. An upside down forest, its deep root systems can be five times bigger than the vegetation above ground. The Cerrado stores 70 per cent of the 13.7 billion tonnes of carbon dioxide (CO_2) it holds underground in these roots[42]. The Cerrado is home to 12 per cent of Brazil's population, about 25 million people. This includes 80 different ethnic groups[43], many of whom live off the rich native produce in the Cerrado.

Considered the cradle of water, the Cerrado is home to the headwaters of South America's major river basins. and provides 40 per cent of Brazil's freshwater. The Cerrado is home to 5 per cent of global biodiversity, supporting a staggering 199 mammal, 837 bird, 150 amphibian, 1,200 fish, 120 reptile and over 90,000 insect species. About 30 per cent of Brazil's wildlife species are only found in the Cerrado[44]. Unfortunately more than half of the Cerrado has already been converted to agriculture[45] and at least 137 animal species of the Cerrado are endangered[46].

Challenges and issues

The Cerrado is one of the biggest and most active agricultural hubs in the world, producing crops and livestock for both national and global markets. While there are environmental protection laws in Brazil, landowners are only required to conserve between 20 per cent and 35 per cent of the native vegetation on their land. Only 8 per cent of the Cerrado is under highly restricted protected areas. Conversion of the Cerrado has been driven by agricultural expansion and what's left untouched is under immediate threat, with an average of 1 million hectares of native vegetation lost annually in recent years. Unsustainable land use results in underperforming and badly degraded pastures which, combined with a lack of law enforcement, leaves the landscape open to land-grabbing and illegal conversion of native vegetation.

Additionally, destabilising this complex ecosystem could lead to an irreversible cycle of degradation affecting not only the Cerrado but also neighboring biomes, including the Amazon and Pantanal. Together, this would accelerate global warming and extreme weather conditions, resulting in significant economic and human impacts[47].

Opportunities and solutions

Through strong partnerships, both in the Cerrado and with global stakeholders, WWF is working to secure the habitat of threatened species, such as the giant armadillo and maned wolf, through the alignment of conservation, business and social development objectives.

WWF is developing connectivity and ecosystem services through the restoration of natural vegetation, rehabilitating degraded pastures for sustainable and better land use, and increasing and effectively managing protected areas. With a focus on the sustainable production of native produce, WWF is supporting traditional communities to improve livelihoods while participating in conservation planning.

In addition, through partnerships with public and private sectors as well as traditional communities, WWF leverages governance, international markets, financial interventions and advocacy to halt the conversion of the Cerrado.

The Cerrado Manifesto, a call for action from companies and investors to defend the Brazilian Cerrado, was launched in 2017 and has been endorsed by over 150 signatories in the private and financial sector. At the same time, the China Meat Association and more than 60 leading meat companies have signed the Sustainable Meat Declaration, which includes an explicit pledge to prevent deforestation and the conversion of natural vegetation by livestock production and feed value chains.

The Cerrado Working Group, a spin-off of the Soy Working Group responsible for the Soy Moratorium in the Amazon, has become an important space for discussions on how the soy sector can eliminate the conversion of natural vegetation in the Cerrado from its supply chain. This group is made up of

42 Critical Ecosystems Partnership Fund. 2017. *Ecosystem profile El Cerrado biodiversity Hotspot*. 482pp.

43 International Livestock Research Institute et al. 2021. *Rangelands Atlas*. Nairobi, Kenya. 39pp.

44 World Wildlife Fund. 2015. *The "Big Five" of the Cerrado*. https://www.wwf.org.br/informacoes/english/?50242/The-Big-Five-of-the-Cerrado. Accessed 25 Aug 2021.

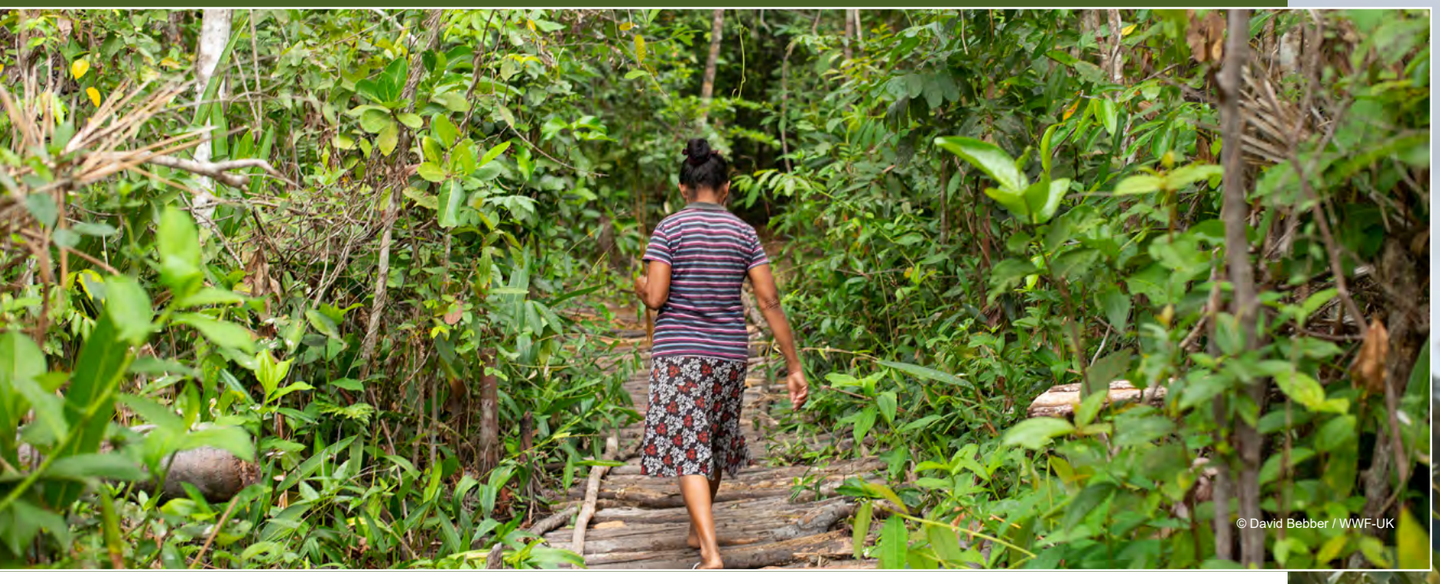
45 International Livestock Research Institute et al. 2021. *Rangelands Atlas*. Nairobi, Kenya. 39pp.

46 Colli, G.R., Vieira, C.R. and J.C. Dianese. 2020 *Biodiversity and conservation of the Cerrado: recent advances and old challenges*. Biodivers Conserv 29, 1465–1475. https://doi.org/10.1007/s10531-020-01967-x.

47 Timmers, J.F. 2019. *Saving the Cerrado: how savannahs and grasslands may tackle climate change at scale, benchmarking the recommendations of the new IPCC Land Report*. https://www.wwf.org.br/?73064/Saving-the-Cerrado-how-savannahs-and-grasslands-may-tackle-climate-change-at-scale-benchmarking-the-recommendations-of-the-new-IPCC-Land-Report. Accessed 25 Aug 2021.

representatives from traders, on-demand companies, farmers, research institutes, government and civil society.

At a local level, WWF-Brazil has been collaborating with the “Central do Cerrado”, a network of more than 30 cooperatives and community associations and involving around 5000 smallholders. Since 2019, WWF has been developing the network’s business model and strengthening its governance with a view to improving market access. In 2021, the partnership underpinned the export of more than 12 tonnes of Baru nuts (this represents 360 tonnes of natural fruits) to the United States, directly benefiting more than 500 families from indigenous and traditional Cerrado communities.



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Recommendations

DEMONSTRATE INTERNATIONAL MARKET LEADERSHIP

1. Implement regulatory initiatives to remove habitat-converting produce from supply chains.
2. Build a growing base of traders and retailers in ‘importing’ nations, focused on changing production patterns in priority landscapes.
3. Analyse the role and shed light on international finance in driving conversion (venture capital/pension funds).

IMPLEMENT A SUSTAINABLE FOOD PRODUCTION DEVELOPMENT PLAN

1. Divert food production expansion to available land (abandoned/degraded) and improve capacity for production.
2. Analyse the cost/benefit of moving to nature-positive production in priority landscapes.
3. Examine the role of national/subnational policies to increase the value of standing forests and unconverted grasslands and savannahs.
4. Influence domestic consumption.

MOBILISE DOMESTIC AND INTERNATIONAL FINANCE BEHIND THE PLAN

1. Analyse unsustainable subsidies (domestic financing) to promote sustainable domestic investment, including an active model of repurposed investment
2. Analyse the upfront investment and access to capital needed to rehabilitate abandoned or degraded lands, with recommendations for the deployment of public and private nature-based funds.
3. Deploy public nature-based funds and leverage other sources to focus on systemic solutions at the landscape level. This needs sufficient time to achieve change and should be aligned with the impact of supply chain interventions.
   Short-term, small-scale projects do not work.

IMPLEMENT TRUE COST ACCOUNTING INTO GLOBAL FOOD VALUE CHAINS

1. Determine monetary values and payment for ecosystem services.
2. Analyze the environmental impacts of food production on different ecosystems and co-create scalable solutions.
3. Integrate hidden environmental costs into food prices.
4. Reward nature-positive food producers.

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ECOLOGICAL CONNECTIVITY: A BLUEPRINT FOR SCALING NATURE-BASED SOLUTIONS

© WWF-Nepal

Authors: *Wendy Elliott, Margaret Kinnaird, Sabita Malla and Gary Tabor*

Ecological connectivity under threat

Connectivity allows species to access the different habitats they need to feed, breed, and maintain genetic diversity. The United Nations defines the concept as "the unimpeded movement of species and the flow of natural processes that sustain life on Earth"[48] and it takes place at different scales across the globe – from a corridor of wildflowers providing food for pollinators to a migratory route that crosses countries and continents.

But the planet's ecological connections are under threat. Agricultural encroachment, fences, and the construction of roads and other hard infrastructure are interrupting the free flow of nature. Protected and conserved areas are increasingly becoming isolated from each other, with ecological processes blocked by human use and infrastructure. Most of these protected and conserved areas are simply too small to sustain the healthy and vibrant ecosystems upon which humans and animals depend.

There are two different types of ecological connectivity. Structural connectivity refers to the physical connections between habitats, and it can often be mapped using remote sensing technology. Functional connectivity refers to the ability of specific species to move through the landscape, and it can be monitored through techniques such as camera traps and satellite tracking.

Climate change means that maintaining connectivity has become increasingly important. As temperatures rise, habitats are changing. Many species are shifting to higher ground or away from the equator, others are adjusting their migration routes to follow the shifting patterns of their prey. When connectivity is lost, these species simply aren't able to move to the new habitats they will need to access due to climate change. Species unable to move may become trapped in areas where the habitat becomes less suitable. It may become harder for them to meet their basic needs as they come into increased competition with human communities for space, food and water. The consequences can be devastating for everyone, including the loss of both human and animal lives, as well as the destruction of crops and livelihoods[49].

Ecological connectivity is not just important to animals but also to humans[50]. Connected landscapes underpin the services upon which we depend, including pollination, water flow and nutrient transport. Maintaining and restoring connectivity will allow animals to move to meet their needs while also protecting the ecosystems on which people depend for survival and well-being. Some wildlife corridors are increasingly being designed with climate change in mind[51]. These climate corridors consider the habitats that can act as refuges in a warmer world and provide safe passage to vulnerable species in the years ahead.

48 Convention on Migratory Species. 2020. *Improving ways of addressing connectivity in the conservation of migratory species*. UNEP/CMS/Resolution 12.26 (Rev. COP13). United Nations Environment Programme.

49 Hilty, J. et al. 2020. *Guidelines for conserving connectivity through ecological networks and corridors. Best Practice Protected Area Guidelines Series No. 30*. International Union for Conservation of Nature. Gland, Switzerland. 122pp.

50 World Wildlife Fund Tigers Alive. 2020. *Landscape Connectivity Science and Practice: Ways forward for large ranging species and their landscapes*. Workshop Report, WWF-International. Gland, Switzerland. 31pp.

51 For more information regarding climate change and corridors please refer to the Conservation Corridor website: https://conservationcorridor.org/digests/climate-change/.

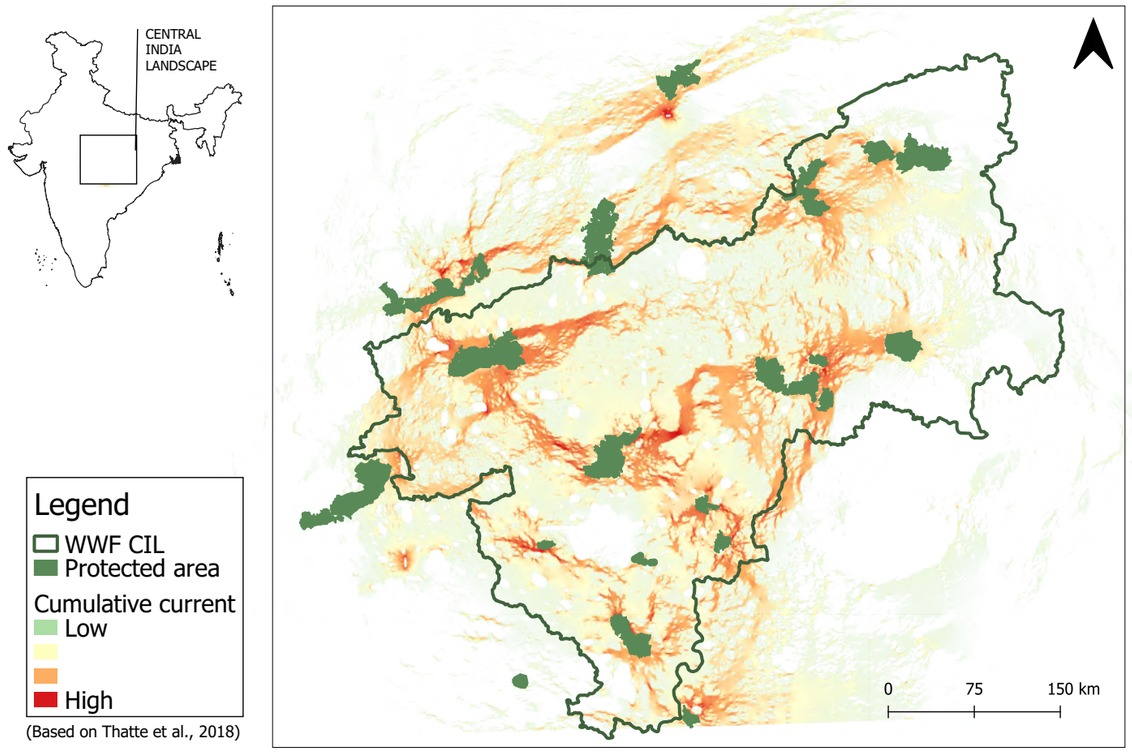
Nature-based solutions for supporting ecological connectivity

Nature-based solutions help humans and non-human species thrive. Indeed, nature-based solutions are one of the few conservation approaches that genuinely deliver on three intertwined global crises: biodiversity loss, climate change and equitable development.

How do nature-based solutions in connectivity zones work? The answer depends on the ecosystem in question and the services that it provides to the humans that live there. In agroindustrial plantations in Asia, for instance, implementing a nature-based solution might mean restoring corridors of natural habitats that allow species such as orangutans and elephants to move between once-isolated forest blocks, reducing the destruction of crops and dangers posed by wildlife to plantation workers. Or it might mean small-scale farmers in tiger corridors shifting to organic production and managing their farms to allow tigers and other wildlife to pass through. In some cases, tigers have been known to use farms to such an extent that they become almost an extension of their habitat – one tigress had three litters of cubs in a sugar cane plantation. In Africa, it could mean developing community-managed conservancies that bring in revenue through ecotourism while also providing space for traditional wildlife and pastoral migration routes.

Understanding the importance of ecological connectivity, and what it delivers for both biodiversity and people, is a fundamentally helpful step towards understanding why nature-based solutions need to be deployed at scale, and where to roll them out. Implementing single, site-based nature-based solution interventions will not deliver the ecological connectivity we all need. Only implementing nature-based solutions along the full extent of ecological corridors and networks will do this. Thus, the increasingly sophisticated connectivity maps available today can provide the blueprint for where to roll out these approaches at scale (for example see Figure 2.1).

Figure 2.1. *Degrees of permeability calculated for tigers in corridors among protected areas of the Central India landscape. Nature-based solutions that address societal challenges while also allowing for wildlife permeability will be needed along all corridors if the overall landscape is to remain healthy and resilient, effectively supporting both wildlife and human communities.*



(Based on Thatte et al., 2018)

Spatial planning is an essential component of connectivity conservation, ensuring that the right activities are occurring in the right places. This avoids major developments in the middle of wildlife corridors – for example, a four-lane highway cutting through an elephant migratory route. Effective spatial planning not only benefits biodiversity and strengthens ecosystem service delivery, but also reduces the risk of the spillover of zoonotic diseases by limiting interactions between humans and their livestock and wildlife.

When designing ecologically connected landscapes, conservationists and local communities must work together to ensure that their mutual work is addressing social and economic needs. Such collaboration increases the chance of success, as it means both groups have a stake in the outcome, but it takes time and patience. When these partnerships are considered, there must also be mechanisms in place to ensure that benefits are fairly distributed among communities, with particular attention to women, vulnerable groups and other disadvantaged people.

Opportunities and challenges

Connectivity conservation requires bringing together a diverse range of stakeholders, including civil society, governments and industry.

Governments have set a growing number of targets at the local, national and international levels relating to ecological connectivity. For example, the Convention on Biological Diversity's emerging Global Biodiversity Framework, which sets the agenda for nature over the next decade, has stronger commitments on ecological connectivity than ever before, requiring governments to "maintain and restore connectivity of natural ecosystems" by 2030.

There are also opportunities for businesses. Many companies across multiple sectors are looking to assess and address their biodiversity risk. Corporate engagement on nature-based solutions that deliver ecological connectivity can provide a powerful story to share with customers: it allows companies to demonstrate that their supply chains within a broader connected and resilient landscapes (see Chapter 1 and 5) perspective are having a positive impact on nature and the climate while also contributing to human well-being.

Some businesses are already making good progress. For example, several multinationals are now requiring that farms maintain or establish wildlife corridors – in some cases, even covering the financial costs of establishing these areas. Financial institutions that channel billions of dollars to major infrastructure projects, such as the Interamerican Development Bank, now stipulate that projects be "designed for maximum ecological connectivity"[52]. Some 200 fashion brands have committed to "wildlife friendly production practices" via the "Fashion Pact" in 2019[53]. This momentum could help launch ecological connectivity at scale across agricultural production lands and development projects.

But there are still barriers to action. Today, ecological connectivity is being held back by the absence of appropriate incentives. Nature-based solutions that deliver connectivity can be expensive to implement and risk increasing the potential for human-wildlife conflict. When land is taken out of production, it can increase costs to the farmer or business. While the ecological and ecosystem service benefits provided are real, they do not always directly yield financial rewards. This is where the policy levers, particularly those related to smart spatial planning and, the systemic enablers (see Systemic enabling framework) come to bear. This lose-lose-lose situation could become a win-win or a win-win-win if an integrated social and economic policy was to be applied.

52 Serebrisky, T. et al. 2018. *IDBG Framework for Planning, Preparing, and Financing Sustainable Infrastructure Projects. Inter-American Development Bank*. 63pp.

53 The Fashion Pact. 2020. *The fashion pact: first steps towards industry transformation*. 56pp.

CASE STUDY - THE KHATA CORRIDOR

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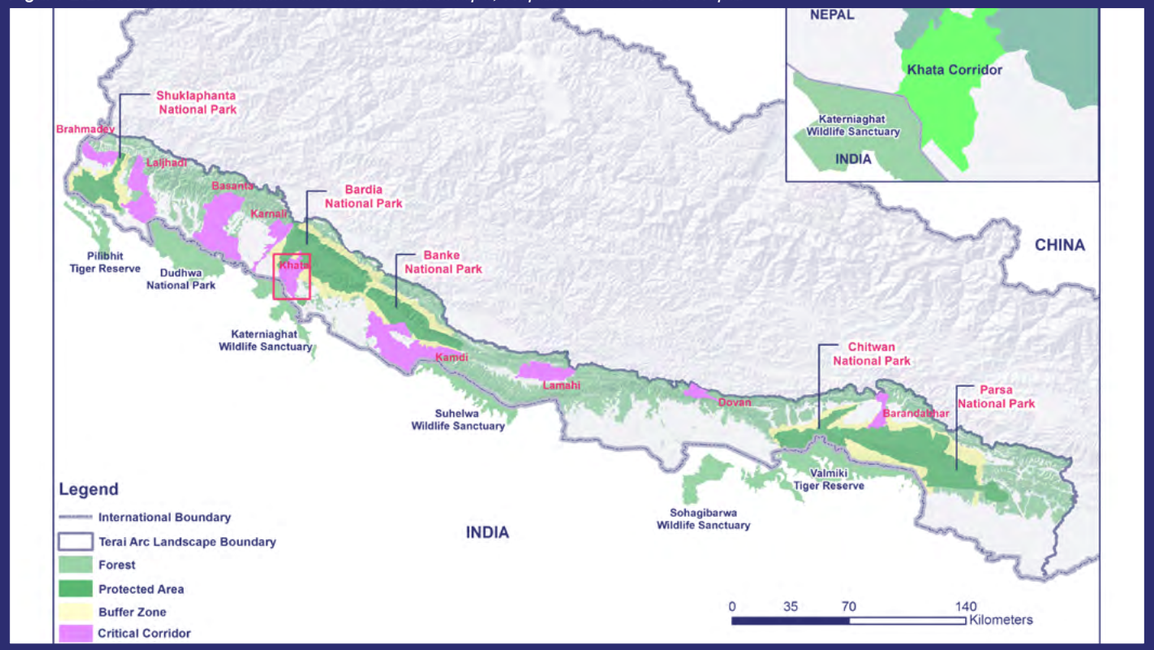
The Khata Corridor is a 13 kilometre stretch of land, covering more than 8,400 hectares, that links the Bardia National Park in Nepal with the Katarniaghat Wildlife Sanctuary in India.

Figure 2.2. Khata corridor within the Terai Arc landscape, Nepal. Source: WWF-Nepal



Until the 1950s, this area was a mix of grasslands and forests. But the eradication of malaria, alongside Nepal's resettlement programmes, led to communities settling along its fertile riverbanks[54], where they hunted wildlife and cleared the forest to make way for cultivation and livestock. This encroachment worsened through the 1990s and early 2000s and, as a result, wildlife could no longer move safely between the two protected areas. People were suffering, too: the degradation of the land led to the spread of invasive plants, which harmed their ability to farm the land.

WWF started working with the Nepalese government to restore the degraded forests in 2001, but efforts were initially met with deep resistance. Communities feared they would lose their land and their rights to harvest forest products. It was clear that a strategic shift was required. Consultations and door-to-door visits allowed for better exchange and understanding of values and needs between conservationists and local communities. Over time, the communities began to place their trust in the project.

These efforts resulted in the formation of Community Forest User Groups, which were given the legal right to protect, manage and use community forests under the 1993 Forest Act. These groups have assisted in the regeneration of the forest, established nurseries and planted seedlings. By regulating resource extraction and cattle grazing, they have allowed natural regeneration to take place. Any cash generated is used to employ members of the local community to protect the fragile growth. By 2018, these efforts had led to a 674 hectare increase in forest area and the restoration of 1,092 hectares of shrub and grassland habitat.

This model has now been scaled up across the region, encompassing another seven critical corridors. As the habitat has improved, communities have learned to live in harmony with the returning wildlife, employing measures such as the use of unpalatable crops to reduce depredation and installing solar fences around fields. Locals have also received support, including access to soft loans to set up new nature-friendly enterprises, including the production of juices, spices, furniture and handicrafts. By the end of 2020, more than 9,000 households were organised into around 74 Community Forest User Groups. All had access to irrigation and safe drinking water.

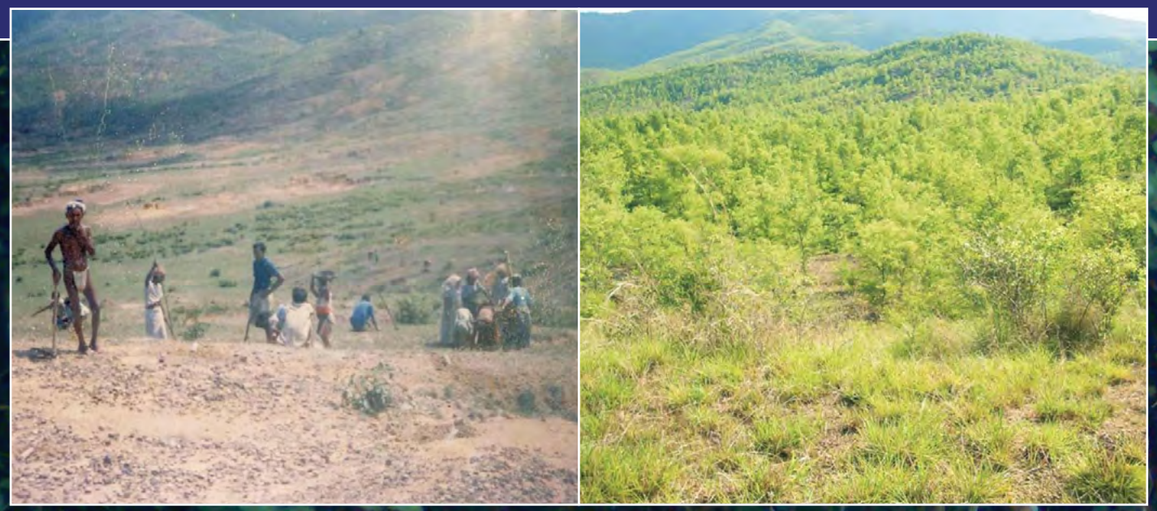
Today, the Khata Corridor is a vibrant forest ecosystem populated by a passionate and engaged community. The corridor is used by more than 30 wildlife species, and studies show that it has played a crucial role in the recovery of tigers and rhinos by facilitating their movement between the two transboundary national parks. Four female tigers have given birth to cubs within the corridor itself. They are protected by community youth groups that undertake anti-poaching patrols

54 Dudley, A. 2017. Behind rising rhino numbers in Nepal, a complex human story. Mongabay News. https://news.mongabay.com/2017/07/behind-rising-rhino-numbers-in-nepal-a-complex-human-story/. Accessed 25 Aug 2021.

within their community forests and community members have become citizen scientists, monitoring the wildlife in the corridor.

It has been a profound transformation – but also a fragile one. The corridor is currently threatened by the construction of the Hulaki Highway, which bisects the land. The government is taking proactive measures to “green” this infrastructure, including a forested wildlife overpass. Even so, once the project is complete, there must be careful monitoring in place to see if and how this overpass is used. Similarly, governance in the Khata Corridor should be tracked to ensure that community well-being and financial benefits continue to be dispersed equitably among residents.

Figure 2.3: *Before and after photos of forest restoration in another Terai Arc corridor, part of the ‘scaling up’ success story of Khata*

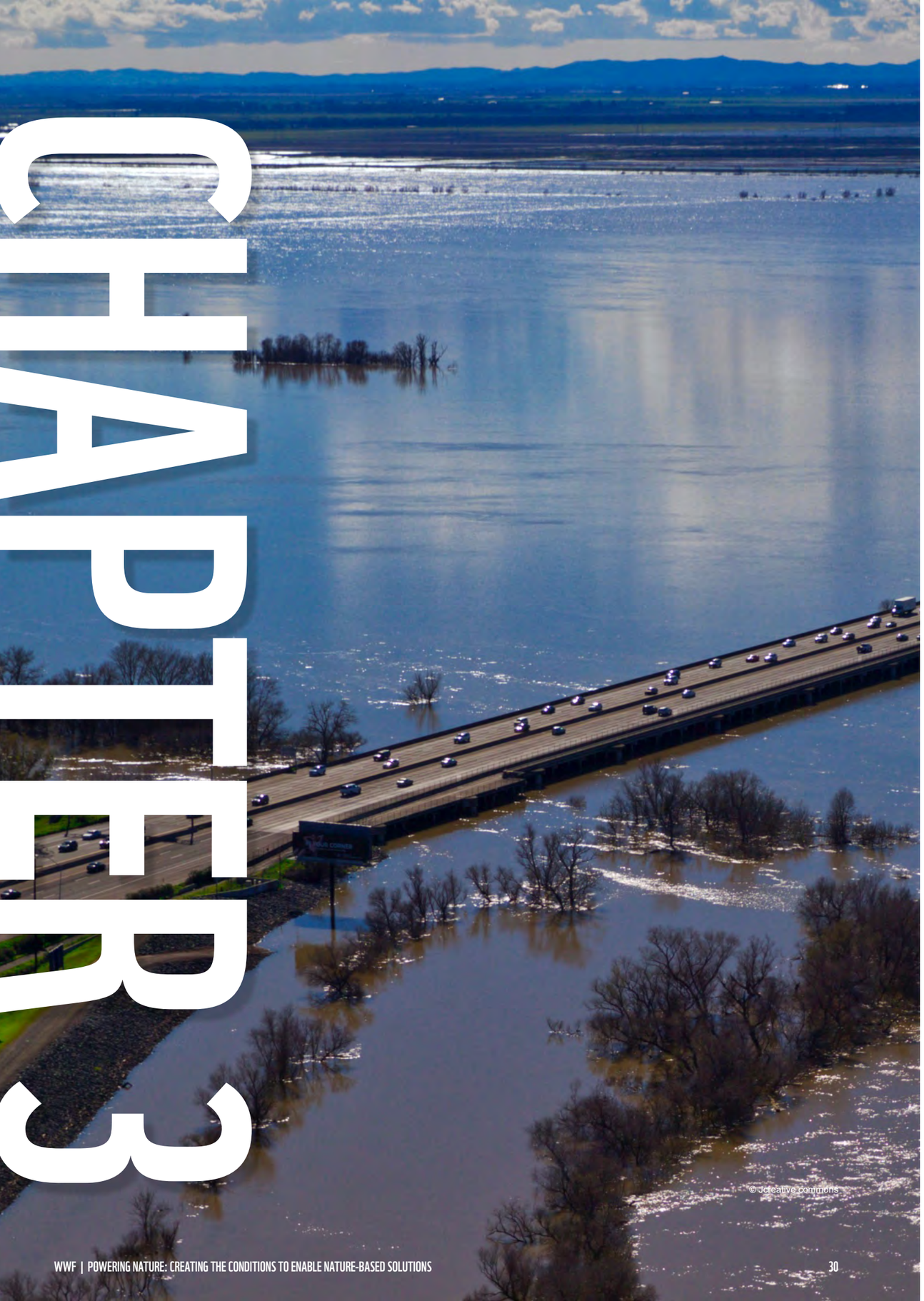


Recommendations

Policymakers: Prioritise the scale-up of nature-based solutions in ecological corridors; incorporate ecological connectivity data into spatial planning decision-making; and create incentives for connectivity-related nature-based solutions.

Agricultural sector: Prevent any conversion of ecological corridors into new production lands; maintain or establish corridors in existing production lands; and manage those lands in ways that allow for wildlife flow, such as sensitive fencing and holistic management of human-wildlife conflict.

Practitioners: Collaborate with diverse stakeholders to co-create and implement nature-based solutions that enhance connectivity, biodiversity and carbon sequestration, while also addressing the most crucial societal challenges; ensure that these benefits are distributed equally among all relevant actors.



NATURE-BASED SOLUTIONS FOR FLOOD RISK REDUCTION

Authors: *Jeff Opperman, Rab Nawaz, Stuart Orr and Dean Muruven*

Overview

Floods are among the most costly natural disasters worldwide, causing more than US$1 trillion in damages since 1980[55]. Both economic and human costs have been increasing in recent years. In 2019, floods were responsible for US$46 billion in economic losses,[56] and more than 100 million people were displaced between 2008 and 2014[57].

In a warming world, destructive floods will become more common and intense. The number of people affected by river floods is projected to double from 65 to 132 million per year[58] between 2010 and 2030. Property damage is projected to triple during the same period.

Too often, debates and decisions for flood risk management focus strictly on engineered structures such as dams, dikes and floodwalls. However, in numerous river systems – including the Mississippi, Rhine, Yangtze and Sacramento rivers – flood managers have acknowledged the limitations of solely relying on structures[59]. Flood management in these systems now features large areas of floodplains that have been reconnected and are allowed to flood, a concept known as “room for the river”.

The potential of nature-based solutions for flood risk reduction

The evolution of flood management in those systems helped to shape an emerging consensus that a “diversified portfolio” approach should be considered to handle flood risks. This portfolio should emphasize non-structural measures such as improved zoning, building codes and insurance to complement or substitute for traditional structural measures, as well as include investment in an under-appreciated line of defense: nature-based solutions that support wetlands and floodplains to reduce flood risk[60].

In addition to reducing flood risk, nature-based solutions can also help restore floodplain ecosystems, which are among the most productive and diverse habitats on the planet.

The productivity of floodplain ecosystems depends on the connectivity between the river and floodplain, such as when floodwaters spread out from the main channel and inundate floodplain habitats. This connectivity between river and floodplain underpins some of the most productive fisheries on Earth, such as that of the Mekong River. In contrast, most structural measures sever the connections between river and floodplains, causing significant negative impacts to the diversity and productivity of the river systems. For example, levees (or dikes) set close to the river greatly reduce the extent of floodplain habitat that is connected to the river, while flood management dams are operated to absorb the flood pulse and send smaller flows downstream, also reducing connectivity between river and floodplain. Of course, this disconnection is the primary objective of traditional flood management: preventing river floods from reaching floodplains and the cities, towns and farms built on them.

In contrast, nature-based solutions that rely on wetland restoration and floodplain reconnection for flood management intentionally allow some areas to become flooded. These solutions offer environmental benefits, such as increasing productivity of riverine food webs, while reducing the risk of flooding for developed areas. Such interventions meet the three primary criteria for nature-based solutions: they provide a societal benefit (reduced flood risk); they use an ecosystem to provide that benefit (floodplains, wetlands) and they deliver environmental benefits (river-floodplain connectivity and wetland inundation).

Options for nature-based solutions

Nature-based solutions can reduce the risk of river flooding in three main ways. The first is to simply preserve, at large-scale, the floodplains that currently exist alongside rivers by preventing the conversion of land to industrial and residential uses. When floodplains are maintained in a land use that is not vulnerable to flooding such as forests, wetlands, or pastures, economic damages from future floods are minimised. Further, the preservation of extensive floodplains increases the area available to store and convey floodwaters, which reduces the risk for flooding settled areas downstream.

55 Munich RE (n.d) *Risks from floods, storm surges and flash floods. Underestimated natural hazards*. https://www.munichre.com/en/risks/natural-disasters-losses-are-trending-upwards/floods-and-flash-floods-underestimated-natural-hazards.html#-24989000. Accessed 25 Aug 2021.

56 World Resources Institute. 2020. *New data shows millions of people, trillions in property at risk from flooding — but infrastructure investments now can significantly lower flood risk*. https://www.wri.org/news/release-new-data-shows-millions-people-trillions-property-risk-flooding-infrastructure. Accessed 25 Aug 2021.

57 Yonetani, M. et al. 2015. Global estimates 2015. *People displaced by disasters*. Norwegian Refugee Council and Internal displacement monitoring center. Châtelaine, Geneva. 105pp.

58 Kuzma, S and Luo, T. 2020. *The Number of People Affected by Floods Will Double Between 2010 and 2030*. World Resources Institute. https://www.wri.org/insights/number-people-affected-floods-will-double-between-2010-and-2030. Accessed 25 Aug 2021.

59 Opperman, J. et al. 2017. *Floodplains: Processes and management for ecosystem services*. University of California Press. 280pp.

60 World Wildlife Fund. 2016. *Natural and nature-based flood management: A Green Guide*. USAID and WWF. Washington, DC. 204pp.

The second focuses on managing land to retain and slow runoff - that is, the rainfall that subsequently flows into rivers and streams. The rate that runoff is generated depends on the amount and timing of precipitation, and is also influenced by how the land is used. Landscapes with healthy soils and vegetation absorb water like a sponge, holding and slowing runoff, while those dominated by hard surfaces such as roads and buildings or pastures with compacted soils behave like a slide, rapidly channelling water towards its lowest point. By changing how the land – including soils, vegetation and wetlands – is managed, the rate of runoff can be reduced. Specific initiatives that slow runoff include reforestation, forest protection and the reintroduction of beavers in watersheds to create new wetlands. Additionally, farmers and ranchers can adopt best practices that promote infiltration of water into their soils.

A third approach focuses on managing flood flows within rivers by integrating the green infrastructure that floodplains provide within the grey infrastructure of engineered flood management systems. For example, large floodways can be inundated during a flood event, expanding the area available to store and convey floodwater, but are otherwise available for other activities, including forestry, recreation, ecotourism and certain types of agricultural activities. Connectivity between a river and a floodway can be managed to provide important habitats for fish, birds and other wildlife.

Nature-based solutions planning and implementation

Two key principles need to be considered when planning and implementing nature-based solutions for flood risk reduction. The first is that flood management is most effective when it is planned and managed at the scale of an entire river basin. It is the land use and water management across the whole river basin that determines the flood risk downstream. Flood management investments that do not consider this wider picture have increased risk of failure.

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Not all flood projects can be implemented at the scale of an entire river basin, usually due to economic cost, institutional complexity, or political boundaries. However, project managers should at least ensure that they fully understand how individual infrastructure projects are influenced by basin-scale conditions.

The second principle is that flood managers should pursue a diversified portfolio of approaches within a river basin, tailoring the mix of investments to the specific needs, constraints and opportunities. A sustainable and resilient approach to flood risk management deploys diverse methods throughout the river basin that consider local conditions while reflecting the wider surroundings.

For example, flood management in a river basin could feature a mix of structural tools such as floodwalls to protect urban areas and levees to protect farmland, and non-structural tools such as early-warning systems, zoning and insurance incentives to avoid the conversion of floodplain. Nature-based solutions can be integrated into this mix by preserving and restoring forests and wetlands that retain runoff and allocating undeveloped floodplains – or strategically reconnecting floodplains to act as “relief valves” during large floods.

A number of barriers are likely to constrain the uptake of nature-based solutions. Engineers, planners and decision-makers may be unfamiliar with a nature-based approach, which means they may overlook this option from the start. Nature-based solutions may also require the involvement of many entities, including various ministries, which may complicate the design and selection processes. Lastly, the regulatory frameworks may be unsuitable since they were developed to oversee traditional approaches.

Abdul Majeed Goraya : IRIN

CASE STUDY- RECHARGE PAKISTAN

In July and August 2010, monsoon rains caused unprecedented flash floods in the hilly regions of northern Pakistan, followed by sustained flooding for six months throughout the Indus river basin.

The event became known as the 2010 Pakistan super flood, impacting 46 of the country's 135 districts. People referred to the floods as a slow-moving tsunami: a wave of water that inundated and destroyed everything in its path.

The disaster killed more than 1,700 people and damaged or destroyed nearly 1.1 million homes[61]. Overall, it is estimated that 14-20 million people were directly affected, while the economic costs of recovery and reconstruction reached around US$11 billion. Half of these costs were borne by the rural economy. The floods caused unprecedented damage to crops, livestock, animal shelters, seed stocks, fertilizers, agricultural machinery, fisheries and forestry.

At that time, flood risk management in the Indus river basin relied nearly entirely on engineered solutions. The super flood revealed the limitations of this narrow approach. In 2012, a delegation from the Pakistan government supported by WWF visited China's Yangtze river basin project to learn about the diverse range of management approaches that were employed in this region. The delegation looked at nature-based solutions involving wetland restoration and reconnection and explored how these interventions could be replicated in Pakistan to increase resilience and help protect both people and ecosystems.

WWF-Pakistan teamed up with the government's Ministry of Climate Change to apply for funding from the Green Climate Fund, and Recharge Pakistan was given the approval by the government of Pakistan in 2019.

Recharge Pakistan consists of three phases, each of which spans a decade, and is implemented across numerous parts of the Indus river basin. Sites are selected based on flood risks, climate change projections, water storage and recharge potential, and the needs of local communities. Specific projects encompass a range of decision-making that will, for example, manage hill slope vegetation to reduce rapid runoff and reconnect floodplain wetlands to store and convey floodwaters. By 2050, the programme aims to have contributed towards improved climate resilience, water and food security, and sustainable livelihoods, and expects to benefit more than 10 million people, equivalent to around 5 per cent of Pakistan's population. A further 20 million people living across 50 vulnerable districts will benefit indirectly from these changes. In addition, Recharge Pakistan will catalyse an unprecedented scale of collaborations between the government, WWF and other stakeholders, as well as among various government entities. Approximately 24 government departments and institutions, both provincial and federal have given letters of support for the initiative, demonstrating that they only recognise the importance of this issue but they are ready to come together and try a new approach to managing floodplains.

Overall, Recharge Pakistan aims to create a paradigm shift in how the country approaches climate adaptation and flood risk management. It also addresses some constraints facing nature-based solutions by mobilising funding, applying engineering rigour to planning nature-based solutions and forging cooperation between diverse partners.

61 Kirsch, T., et al. 2012. Impact of the 2010 *Pakistan Floods on Rural and Urban Populations at Six Months. Version 1*. PLoS Curr, 4. https://doi.org/10.1371/4fdfb212d2432.

Recommendations

Despite the multiple benefits that nature-based solutions can provide, currently less than 1 per cent of total investments in water management infrastructure is allocated toward nature-based solutions[62], due in large part to the constraints listed above. We offer recommendations that address the barriers to a broader adoption of nature-based solutions for managing risk of floods and other disasters:

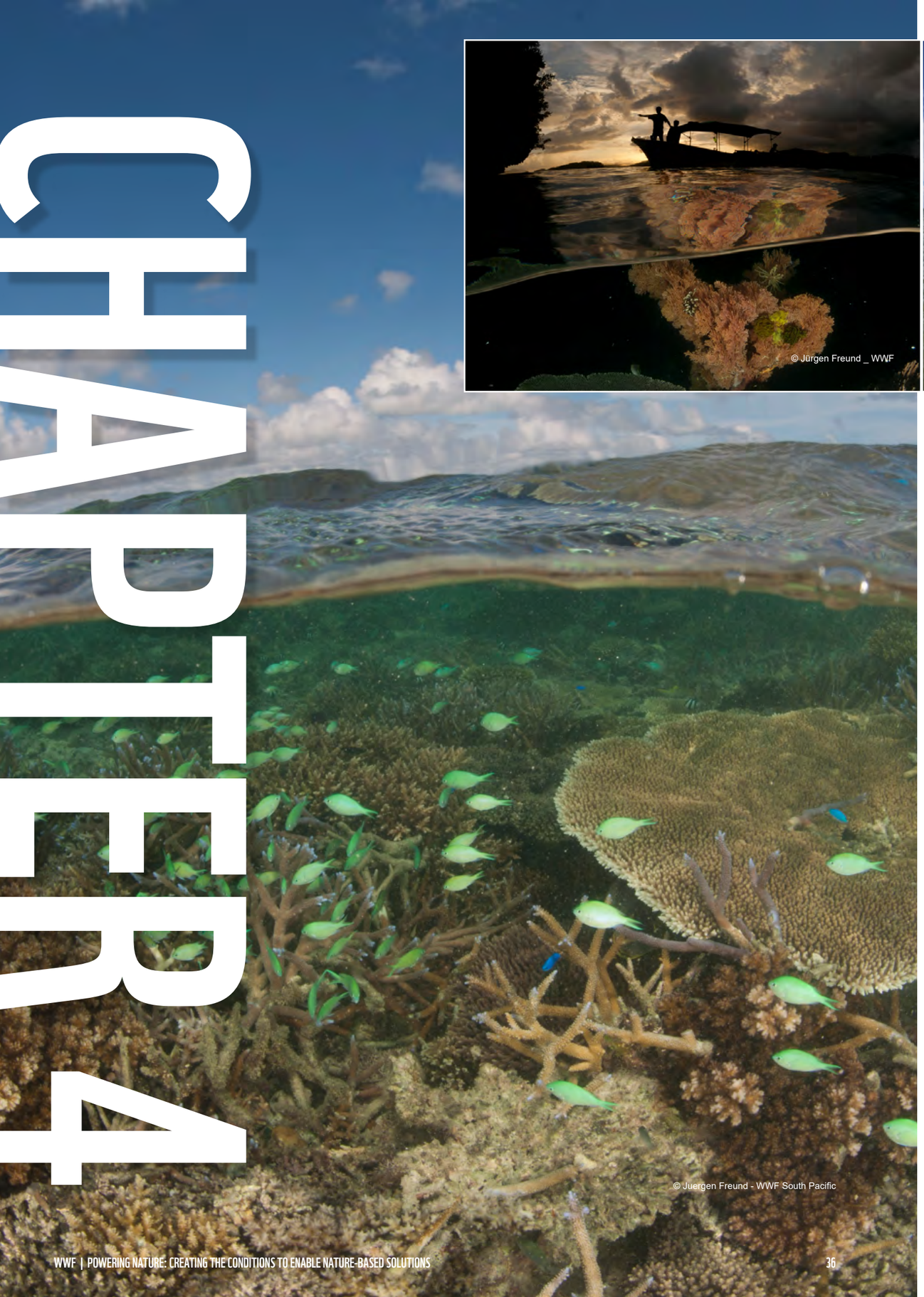
1. **Nature-based solutions can benefit a wide range of sectors.** Policymakers should pursue proactive collaboration among multiple sectors to leverage the various sources of funding that can flow to joint initiatives.

2. **Nature-based solutions initiatives are often promoted and funded by external donors or NGO programs.** Externally driven projects may neglect local government and community capacity building, resulting in programs that are not durable and may even produce unwanted outcomes at the local scale. Funders, policymakers and practitioners should strive to adopt an inclusive approach when designing and implementing nature-based solutions, ensuring that local knowledge is included, capacities are enhanced and conditions are in place for fostering autonomous implementation of nature-based solutions.

3. **Financial support from a range of sources is needed to close the gap in funding for adaptation.** Current estimates suggest that annual demand for adaptation investment in developing countries is approximately US$70 billion and could increase to US$500 billion by 2050[63]. While international funding sources can help catalyse nature-based solutions projects, policymakers need to integrate nature-based solutions approaches into the main budgets of the countries' ministries that manage rivers, coasts and other resources.

62 World Water Assessment Programme. 2018. *The United Nations World Water Development Report 2018: Nature-Based Solutions for Water*. United Nations Educational, Scientific and Cultural Organization. Paris, France. 139pp.

63 United Nations Environment Programme. 2021. *Adaptation Gap Report 2020*. Nairobi, Kenya. 99pp.



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AN OCEAN OF OPPORTUNITY FOR NATURE-BASED SOLUTIONS

Authors: *Ghislaine Llewellyn and Mark Drew*

Protecting and restoring coastal habitats are some of the most familiar types of nature-based solutions. Natural coastal habitats (or “natural infrastructure”), such as mangroves, seagrass, coral and shellfish reefs, and coastal wetlands associated with deltas and estuaries, play a vital role in the resilience of economic, social and natural systems to extreme events and other impacts of climate change.

The value of coastal habitats

Natural coastal habitats physically stabilise landscapes and coastlines. They help prevent erosion and provide a buffer against storms and flooding – and so, have a critical role in disaster risk reduction. Estimates of the economic value of mangroves for flood risk reduction exceed US$65 billion a year and if mangroves were lost or destroyed, 15 million more people would be flooded annually across the world[64]. The resilience of natural coastal habitats and hybrid coastal infrastructure are directly linked to the health and disaster preparedness of coastal communities.

Coastal, estuarine and deltaic ecosystems also provide ecological services, including important spawning grounds and nurseries for fish and shellfish. These, in turn, support coastal communities’ food security and livelihoods. Seafood derived from these habitats is a primary source of nutrition for many poor and vulnerable communities in least-developed countries.

The ocean is the planet’s largest carbon store. Oceans, coasts and deltas hold carbon – including in the layers of sediment and the ecosystems they support. Per unit area, seagrass meadows, mangrove forests and salt marshes are more effective stores of carbon than tropical forests[65], and although coastal wetlands only represent less than 3 per cent of terrestrial forests coverage, they are able to sequester similar amounts of organic carbon annually[66].

These types of coastal vegetated wetlands are the main blue carbon habitats, due to their ability to sequester and store

64 Menéndez, P. et al. 2020. *The Global Flood Protection Benefits of Mangroves*. Sci Rep 10, 4404. https://doi.org/10.1038/s41598-020-61136-6.

65 Svennevi, B. 2018. *Top 5 most efficient ecosystems for carbon storage*. University of Southern Denmark. https://www.sdu.dk/en/om_sdu/fakulteterne/naturvidenskab/nyheder2018/2018_10_29_eelgrass. Accessed 25 Aug 2021.

66 Gulliver, A. et al. 2020. *Estimating the Potential Blue Carbon Gains From Tidal Marsh Rehabilitation: A Case Study From South Eastern Australia*. Frontiers in Marine Science, 7:403. https://doi.org/10.3389/fmars.2020.00403.

large amounts of carbon within their root systems and in the underlying soil in which they grow. Blue carbon is an emerging concept, and the vital sequestration services coastal habitats provide are rarely featured in global efforts to mitigate carbon emissions. Information gaps still exist. For example, there is much to learn about the carbon buffering potential of ocean biomass including shellfish, fish and marine megafauna, as well as the benefits of undisturbed sediment. As we gain a better understanding of these processes, the value that coastal vegetated wetlands provide can be considered in discussions about the trade-offs associated with various ocean uses, development and conservation choices.

Threats to coastal ecosystems

Over the last 30-50 years, degradation and destruction of the world's coastal ecosystems have accelerated. In many cases, damage has been abrupt and irreversible and is directly caused or made worse by human activities – such as coastal development leading to habitat conversion, hardening of coastlines, reclamation or inundation of coastlines and alteration of fluvial processes. Observed changes include coastal erosion, loss of coastal vegetated ecosystems (50 per cent of salt marshes and at least 35 per cent of mangroves)[67], loss of living coral (50 per cent)[68] and shellfish reefs (85 per cent)[69], and the sinking and shrinking of many deltas due to upstream sand extraction.

The ecosystem services provided by natural coastal systems are severely diminished as a result of habitat destruction and degradation. The decline in physical and ecological resilience leads to the loss of provisioning and support services, activates the release of stored carbon and weakens the system's ability to sequester more. A recent paper that examined the state of the world's mangrove forests indicated that intertidal mangrove forests occur along tropical, subtropical and some temperate coasts, often overlapping with high and increasing densities of human populations. As such, they provide important ecosystem services – such as fish, timber, fuelwood, coastal protection, pollution control, and cultural values for hundreds of millions of people. Most recently, the role of mangroves in carbon sequestration has been strongly promoted, with mangroves now firmly on the international climate mitigation and adaptation agenda"[70].

Nature-based solutions: an opportunity for coastal habitats

There is a growing recognition that building with nature – in which natural processes deliver a number of benefits, such as protection against flooding and coastal erosion – can lead to a green recovery for our coasts and support the restoration of vital ocean systems. Harnessing the power of nature, using green infrastructure such as forests, wetlands and mangroves to complement engineered grey infrastructure, can provide services at lower cost while delivering multiple additional benefits. (See Figure 4.1).

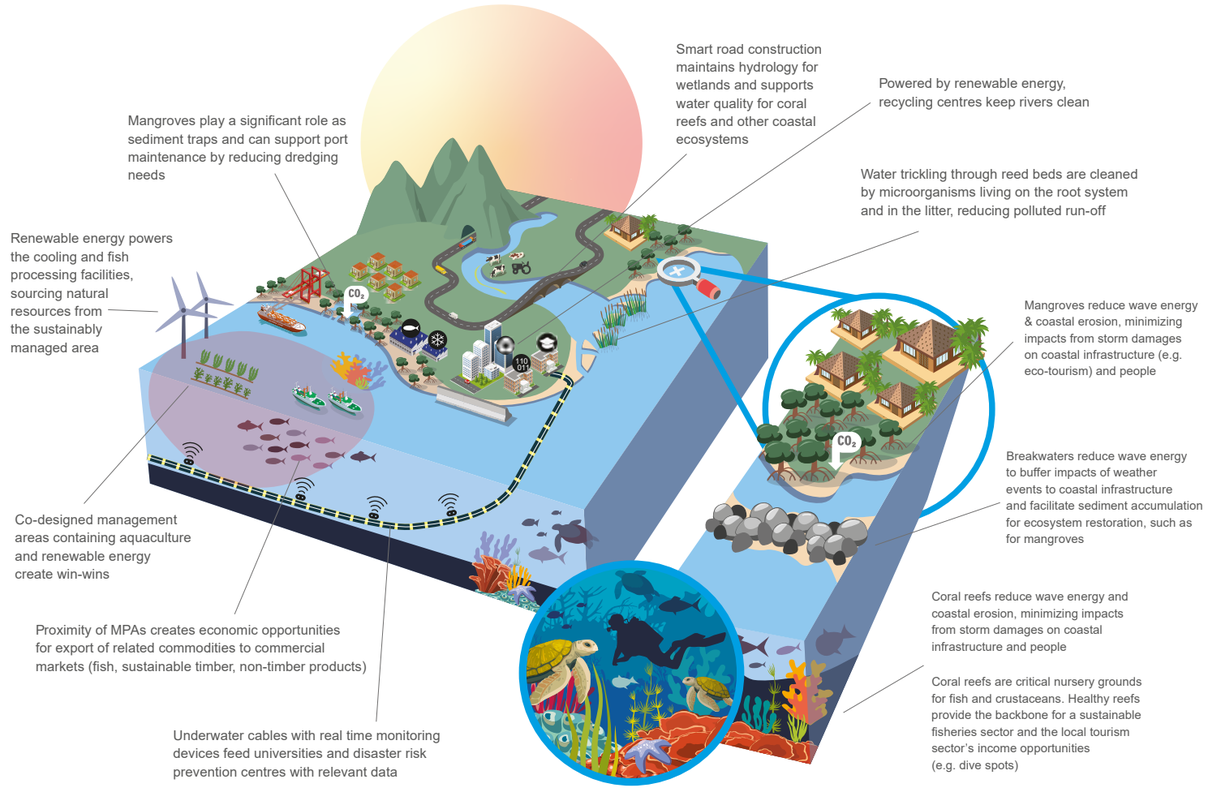
Halting and reversing the decline of coastal habitats offer an ocean of opportunity for large-scale application of nature-based solutions. The delivery of nature-based solutions must be part of an approach that addresses three intertwined global crises: biodiversity loss, climate change and equitable development. The multiple benefits that nature-based solutions deliver can help leverage a growing pool of public and private funding linked to sustainable blue economy approaches that integrate nature-based solutions, disaster risk reduction and community enterprise opportunities. The Action Plan for Healthy Oceans for sustainable blue economies launched by the Asian Development Bank (ADB) in 2019 is one such initiative. Other national initiatives such as the Pakistan government's Green Stimulus include the deployment of ocean and coastal nature-based solutions[71].

The link between healthy ecosystems and healthy populations is well-demonstrated in tropical archipelagic nations and Small Island Developing States (SIDS). Many coastal communities depend on subsistence and small-scale fishing and those in low-lying areas are amongst the most vulnerable to the impacts of climate change. These regions have a high ratio of coast to land area and will particularly benefit from nature-based solutions. Community-based approaches are important enablers of nature-based solutions and have demonstrated their value in strengthening environmental and social resilience in many cases.

For example, after experiencing a natural disaster, small islands have adopted community-based approaches to reduce their vulnerabilities. After the 2004 Indian Ocean tsunami, the island of Koh Klang in Thailand embedded community- and ecosystem-based methods in efforts to recover the ecosystem and build better resilience.[72]

In Trinidad and Tobago, an inclusive co-management approach involving a variety of community stakeholders facilitated the expansion of cohesive, social networks for handling extreme events associated with climate change, while strengthening the resilience of ecological systems.[73]

***Figure 4.1**. Coastal infrastructure with nature-based solutions*



Source: Thiele, T. (2020)[74]

67 Steven, A.D.L. et al. 2020. *Coastal Development: Resilience, Restoration and Infrastructure Requirements*. World Resources Institute. Washington, DC, USA. 83pp.

68 Hoegh-Guldberg, O. et al. (2018) *Climate Change Threatens the Survival of Coral Reefs Only 12 years to Avoid the Worst Damage*. Paper prepared for COP14 of the Convention on Biological Diversity. International Society for Reef Studies. Poland. 4pp.

69 Gulliver, A. et al. 2020. *Estimating the Potential Blue Carbon Gains From Tidal Marsh Rehabilitation: A Case Study From South Eastern Australia*. Frontiers in Marine Science, 7:403. https://doi.org/10.3389/fmars.2020.00403.

70 Friess, D. et al. 2019. *The state of the world's mangrove forests: past, present, and future*. Annual Review of Environment and Resources, 44: 89-115. https://doi.org/10.1146/annurev-environ-101718-033302.

71 Aslam, M.A. 2021. *How Pakistan is aiming for a green recovery from the pandemic*. World Economic Forum. https://www.weforum.org/agenda/2021/02/pakistan-green-recovery/. Accessed 25 Aug 2021.

72 Pei-Shan, S. 2019. *Building resilience through ecosystem restoration and community participation: Post-disaster recovery in coastal island communities.* International Journal of Disaster Risk Reduction, 39: 101249. https://doi.org/10.1016/j.ijdrr.2019.101249.

73 Tompkins, E.L. and Adger, W.N. 2004. *Does adaptive management of natural resources enhance resilience to climate change?* Ecology and Society, 9(2): 10. http://www.ecologyandsociety.org/vol9/iss2/art10/

74 Thiele, T. et al. 2020. *Blue Infrastructure Finance: A new approach, integrating Nature-based Solutions for coastal resilience*. IUCN, Gland, Switzerland.

Obstacles to nature-based solutions

The implementation of nature-based solutions faces a number of obstacles. Coastal development planning rarely considers the full range of impacts and costs associated with the removal of habitat in project design. An accurate valuation of the contributions of coastal and ocean ecosystems is essential if they are to be considered in proposed projects. Blue-carbon accounting methodologies need to be developed along with processes that consider the role of coastal habitats in countries' national accounts. Such an approach will provide the basis for a systematic assessment of the proposed changes in coastal habitat use that includes carbon stock monitoring along with economic and social criteria.

Local decision-makers may favour engineered solutions and nature-based solutions are still largely absent from the engineering and economics textbooks that serve as reference for the engineering community. To address these barriers: capacity should be built at all levels; engineering rule books need to include nature-based solutions; and financial incentives must be improved. An inventory of nature-based and hybrid solutions (where interventions combine engineered and nature-based solutions) showcasing alternatives to the more typical hard engineering approaches will also help grow support for nature-based solutions. Such changes will ensure that coastal nature-based solutions can be mainstreamed effectively.

Implementing nature-based solutions for coastal systems

To be successful, nature-based solutions need to be applied to systems at scales commensurate with landscape- or seascape-level approaches. For example, the Building with Nature project[75] led by Wetlands International, Ecoshape and their collaborators in Indonesia is a pioneering example of how a holistic and coastal-scale vision helps identify trade-offs and opportunities. The project tackles the root causes of the subsidence that plagues so many coastal urban centres and deltas, and looks to use nature-based solutions to leverage planned infrastructure projects such as coastal toll roads.

Other exciting "at scale" initiatives underway from the private sector include the work led by the insurance company Willis Towers Watson to provide parametric insurance for the Meso American Reef that incentivises the protection and regeneration of protective coastal habitats[76], or the investment made by the development finance institution CDC in the Zephyr clean energy project in Pakistan for a mangrove-planting initiative that enhances protection and delivers fisheries benefits[77].

International financial institutions such as the Green Environment Facility and the Green Climate Fund can offer incentives, such as concessional loans and blue bonds, but there has to be reciprocal demand from their member countries. Nature-based solutions that meet Nationally Determined Contributions (NDCs), National Biodiversity Strategies and Action Plans (NBSAPs), and Sustainable Development Goals, including the Sendai Framework on disaster preparedness hold great promise for both public and private finance, and for blended finance options.

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75 For more information about the initiative please refer to: https://www.ecoshape.org/en/pilots/building-withhttps://www.ecoshape.org/en/pilots/building-with-nature-indonesia/h-nature-indonesia/.

76 Anon. 2021. Willis Towers Watson *Collaborates on Hurricane Insurance for Endangered Coral Reef*. Insurance journal. https://www.insurancejournal.com/news/international/2021/06/04/617172.htm. Accessed 25 Aug 2021.

77 CDC Group. 2017. Zephyr Power. *Future-proofing business in a changing climate.* https://www.cdcgroup.com/en/story/zephyr-power/. Accessed 25 Aug 2021.

CASE STUDY - THE GREAT SEA REEF RESILIENCE PROGRAMME

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The Great Sea Reef, locally known as Cakaulevu, has been central to Fijian life for hundreds of years. Some 40 per cent of Fiji's population directly depend on the reef for their food and livelihoods, which provides natural protection to coastal habitats[78].

78 Earth Observatory. 2011. Cakaulevu Reef, Fiji. https://earthobservatory.nasa.gov/images/51731/cakaulevu-reef-fiji. Accessed 25 Aug 2021.

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Cakaulevu is the third longest barrier reef in the Southern Hemisphere at over 200 kilometres. It plays a significant role in the cultural heritage of the Fijian people and has become a popular global tourist destination. Sixty-five per cent of foreign exchange earnings and 20 per cent of GDP in Fiji are directly derived from the reef, either through tourism or from other economic activity.

Overfishing, agricultural runoff and the adverse effects associated with climate change – primarily coral bleaching and ocean acidification – are taking a toll and threatening to drastically reduce the reef's natural and economic productivity[79]. In response to these challenges, Fiji has placed a high premium on saving and restoring Cakaulevu. The government has supported communities to designate a number of marine protected areas (MPAs) and set aside other areas for continued fishing and economic use. This is now replenishing some fish stocks and slowing the reef's degradation. However, Fijian officials have recognised that more comprehensive and concerted action is needed.

A financially sustainable model for growth and regeneration

In 2017, WWF-Pacific and the WWF Landscape Finance Lab launched the Great Sea Reef (GSR) Resilience Programme with various Fijian government ministries and other partners. The GSR Resilience Programme aims to ensure that Cakaulevu and coastal ecosystems are healthy and resilient to a changing climate. To do so, the programme focuses on: 1) holistic land and marine use planning, ecosystems management and climate buffering; 2) developing and nurturing existing financial systems for sustainable natural regenerative production and practices with market outcomes; and 3) designing and strengthening systems for the removal of primary waste and pollution.

To help support Fiji's GSR Resilience Programme, the WWF's Landscape Finance Lab has facilitated the much-needed flow of finance into the many components of the plan and, above all, support for green and blue businesses in Fiji. The first step was to perform a comprehensive analysis of the multiple sectors deemed to be regenerative. From there, partners developed the financial tools to strengthen and assist private sector enterprises. The eventual result of this work was the formation of Matanataki[80], a dedicated financial partnership that sources investable businesses and attracts international investors, including private funders and international development institutions.

Since March 2019, Matanataki has reviewed over 120 businesses in Fiji and identified 37 businesses and a US$75 million investment needed for bankable pipeline projects. Five key sectors are the focus for investment: regenerative agriculture; forest restoration; waste and plastic management; renewable energy; and sustainable fisheries and ecotourism.

In addition, the GSR Resilience Programme is working with partners to develop innovative insurance mechanisms to cover the agriculture and fisheries sectors, as well as reef clean-up in the event of a natural disaster.

The long-term impacts will be to incentivise local companies to develop and implement sustainable business plans, help grow the Fijian economy, create sustainable jobs, reinforce good governance and transparency and, ultimately, to replicate the model and apply it elsewhere, such as Indonesia and the Solomon Islands.

Recommendations

1. Policymakers should include protective coastal habitats on the balance sheet, to better value the multiple benefits they provide, and include them in overall disaster risk reduction frameworks.
2. Policymakers and practitioners should substitute natural and hybrid infrastructure solutions for hard coastal engineering models and/or leverage large coastal infrastructure projects with nature-based solutions components and innovative finance.
3. Policymakers and practitioners should integrate local knowledge into community-based and traditional tenure/management models to build resilience into both human and ecological systems as an effective way to cope with environmental change.
4. Policymakers and practitioners should promote aquatic/blue foods and food systems in the design and implementation of nature-based solutions to increase food security, especially in nutritionally vulnerable countries such as SIDS.


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79 United Nations Environment Programme. 2018. *Fiji's Great Sea Reef nominated as Ramsar Site at start of International Year of the Reef.* https://www.unep.org/news-and-stories/press-release/fijis-great-sea-reef-nominated-ramsar-site-start-international-year. Accessed 25 Aug 2021.

80 For more information about the initiative please refer to: https://matanataki.com/about-us/.

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THE IMPERATIVE TO DEVELOP 'CLIMATE-SMART' NATURE-BASED SOLUTIONS

Authors: *Ryan Bartlett, Rebecca Snyder, Melissa De Kock and Shaun Martin*

Climate change is an existential threat to the biodiversity and ecosystem services that, together, underpin successful nature-based solutions. Warmer temperatures and changing weather patterns mean that, even with aggressive emissions reductions and robust conservation measures, nature-based solutions are likely to become less effective – or even fail – over time. Unless there is an honest assessment of these risks, conservation groups like WWF risk overselling the promise of nature-based solutions to both local communities and global actors.

It is well-documented that nature can buffer the impacts of climate change on people: well-established practices like ecosystem-based adaptation and ecosystem-based disaster risk reduction are designed to help communities adapt to a riskier future. Yet very few of these efforts have considered the impacts of climate change on ecosystems themselves.

Peer-reviewed studies have demonstrated that climate change is already impacting every major biome on Earth and compromising their capacity to deliver nature-based solutions to societal challenges, such as food and water insecurity and disaster risk reduction. The situation will only grow worse in the decades to come.

For example, a nature-based solution to climate change mitigation is to reforest land: trees store carbon and help to draw down carbon from the atmosphere. But extreme weather events, fires, and an increase in pests and diseases, are causing forest die-off events. When this happens, stored carbon is released into the atmosphere, negating mitigation efforts. Blue carbon faces similar risks: marine heatwaves, for example, are already leading to seagrass die-off and reduced growth, which is reducing the ocean's capacity to store carbon.

Human responses to shifting weather conditions also pose risks to nature-based solutions, compounding the direct impacts of climate change. Reforestation efforts, for instance, are threatened by farmers who have decided to relocate as the local climate changes. Mangroves, a popular target for investment in nature-based solutions due to their ability to sequester carbon and buffer against storms, also face anthropogenic pressures driven by human responses to climate change. In Cameroon, for instance, communities have felled these coastal forests and have used the timber to construct new homes as they migrate from areas vulnerable to storms and sea level rise.

In some cases, poorly planned nature-based solutions can even exacerbate vulnerabilities to climate change, defeating the purpose of the intervention. For example, grasslands are well-adapted to frequent low-intensity fires and retain large stores of soil carbon; afforesting these lands increases the risk of hotter fires, which may destroy the new trees and ultimately reduce the carbon sequestered by the land. Recent research has shown that 12 per cent of reported interventions, especially reforestation, actually exacerbated climate change impacts by, for example, increasing water scarcity.[81]

The science clearly demonstrates the importance of considering climate risks to the delivery and long-term viability of nature-based solutions. To tackle these risks, scientists have identified general approaches like scenario planning, as well as more prescriptive ideas for certain ecosystems, including species selection, planting locations and tree density. Yet, despite the growing body of research in this area, there is limited evidence that this research has informed the strategy or implementation of these solutions. WWF is among the organisations beginning to evaluate climate risks to nature-based solutions, and is responding to these through both generalized and specific approaches.

81 Chausson, A. et al. 2020. *Mapping the effectiveness of Nature-based Solutions for climate change adaptation.* Glob Change Biol, 26: 6134–6155. https://doi.org/10.1111/gcb.15310.

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CASE STUDY - COMMUNITY-BASED CONSERVATION IN NAMIBIA

In the 1990s, the Namibian government launched a community-based natural resource management programme. The idea was to allow communities to benefit socially, economically and culturally from the sustainable use of wildlife and the resources generated from the associated tourism, while also building their adaptive capacity to external shocks – environmental or otherwise. As provided for in national wildlife legislation, communities can establish 'conservancies', democratic governance entities run by their members, and then benefit from the sustainable management of wildlife within them.

Conducted in partnership with local NGOs and WWF, this programme has created new jobs in the tourism sector, generated income through the harvesting of natural resources, and has even provided meat to communities from legal hunting. The economic and ecological benefits are already evident: in 2019, this programme supplemented the traditional livelihoods of more than 200,000 residents by over US$10 million, while wildlife populations have increased substantially.[82]

But Namibia is an arid country, and climate change is threatening the viability of this programme as a nature-based solution. The country is projected to become hotter and drier, on average, with increased extreme drought and flooding events.

For instance, the government programme has promoted the harvest and sale of devil's claw, a native medicinal plant, as a source of income – yet its production has already declined due to drought. With such conditions projected to intensify in the coming decades, devil's claw harvesting may not endure as a viable livelihood option for local communities. Wildlife, too, has been affected by the drought, with reduced water availability and food sources (both vegetation and prey species).

Inadvertently, community responses to drought conditions are also undermining nature and the services that it provides. A great many rural residents of the northwest and northeast conservancies have lost their livelihoods as crops have failed and livestock died. This has forced farmers to open new fields, cutting down trees to do so, or taking their livestock further from their kraals. This has increased conflict with predators, which prey upon the surviving animals, and at times resulting in retaliatory killing. There is increasing competition for grazing space and water, both among people and between people and wildlife. Drought is also resulting in increased fishing pressure on freshwater resources. In their quest to survive, communities are unintentionally undermining the nature that has the potential to sustain them.

To address the climate risks facing these nature-based livelihoods, WWF and partners have carried out modelling assessments to determine how wildlife, natural resources and the traditional livelihoods that depend on them will be affected by worsening climate change. WWF, in collaboration with the Integrated Rural Development and Nature Conservation (IRDNC), a Namibian NGO, has developed a climate risk assessment and adaptation planning tool to co-develop adaptation plans with the communities with whom they are working.

Unless addressed, climate change will undermine this large-scale nature-based solutions initiative, along with the benefits it brings to more than 200,000 people. Improved understanding of these risks – and how to respond to them – will be essential, as will seeking additional livelihoods to complement the services that nature may no longer be able to provide. Building the capacity of local stakeholders on climate change and enabling ownership of the adaptation process by both communities and local NGOs, will be central to the long-term success of this nature-based development programme.

82 World Wildlife Fund (n.d.) *Conserving Wildlife and Enabling Communities in Namibia*. https://www.worldwildlife.org/projects/conserving-wildlife-and-enabling-communities-in-namibia. Accessed 25 Aug 2021.

CASE STUDY - CLIMATE-SMARTING ECOSYSTEM-BASED ADAPTATION IN THE MESOAMERICAN REEF

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Climate change poses a growing threat to the communities living alongside the Mesoamerican Reef[83], located within the Caribbean Sea along the coasts of Mexico, Belize, Guatemala and Honduras. This is the largest transboundary reef system in the world, and millions of people depend on its resources for their livelihoods. Yet this reef and its connected coastal ecosystems are now facing increasingly frequent and intense storms, longer and more intense drought, shifting rainfall patterns and rising sea levels – impacts which are, in turn, destroying crops, reducing fish catches, increasing human migration, and forcing communities to retreat from coastal flooding and erosion. In 2018, WWF launched the Smart Coasts project in partnership with a number of universities and government agencies, to plan for and address these risks.

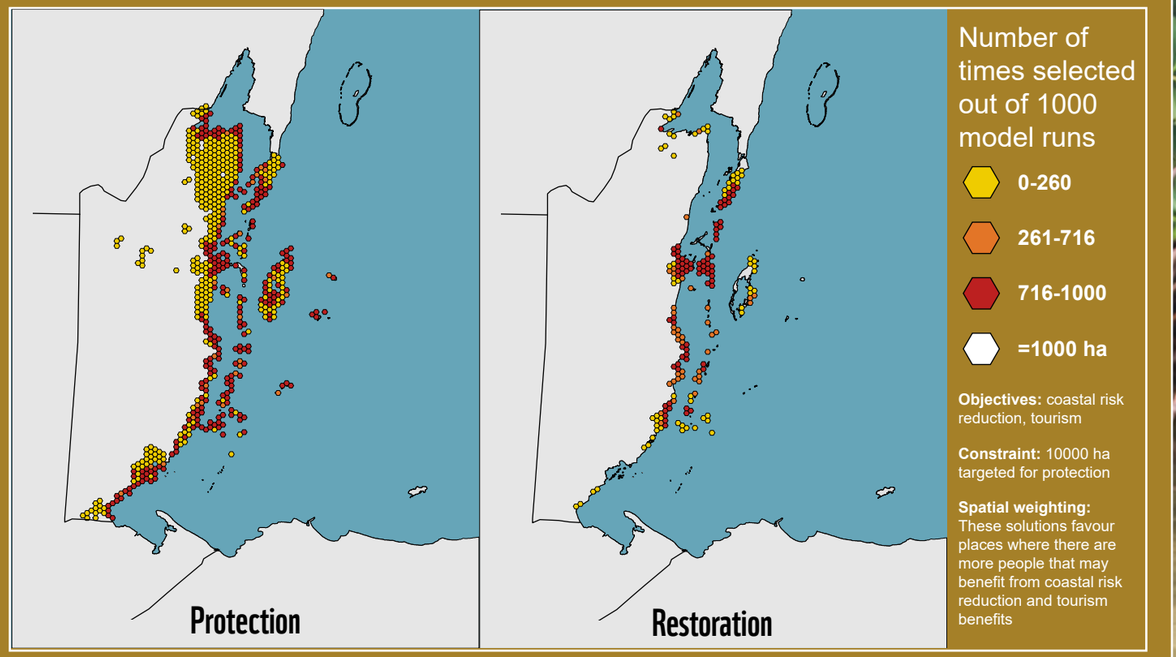
This project uses innovations in the modelling of ecosystem services and climate risks to guide adaptation planning and implementation at the local, regional and national levels. Community members and local experts identified the ecosystem services that support their livelihoods and the climate risks that could have the greatest impacts on their income, as well as the ways in which nature could protect them from these threats. These ecosystem services – including: the ability of upstream forests to regulate sediments; tourism revenue generated by coastal protected areas; the fisheries supported by coral reefs; and coastal defences provided by intact coastal ecosystems such as mangroves and reefs – were then fed into a model of how ecosystems would respond to alternative climate scenarios,

So far, the results have shown the importance of maintaining healthy ecosystems under alternative climate scenarios, and have demonstrated how integrated analysis can be used to pinpoint community priorities for nature-based solutions and ecosystem-based adaptation. For instance, the resulting maps have shown not only where mangrove restoration needs to take place to deliver the greatest coastal protection, but also how that protection would diminish under increased sea level rise and coastal erosion. This is essential information for guiding restoration and protecting investments. Some places, for example, may not be worth protecting because they will be lost to sea level rise in the coming decades regardless of any investment, whereas others will continue to protect the coast against storms.

These maps are already being used by the government of Belize to update its Nationally Determined Contribution (NDC) under the Paris Agreement. In the future, WWF will use these maps to guide new mangrove restoration projects that both maximise community benefits and reduce climate risks – the first WWF project that has explicitly integrated climate change projections and ecosystem service models in this way.

83 For more information please refer to: https://www.worldwildlife.org/places/mesoamerican-reef.

Figure 5.1. Modeling mangrove restoration and protection priorities in Belize



Red areas are the highest priority areas to target for mangrove protection and restoration most frequently selected by the models to reduce risk from coastal hazards and support tourism activity. While results suggest targeting mangrove protection and restoration within these red areas, they do not indicate that the whole hexagon should be protected, as mangroves may only exist within some portion of the hexagon, which represents a unit of analysis of 1,000 hectares (ha). Source: Stanford University Natural Capital Project, Smart Coasts Project, 2020.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Recommendations

Some climate change impacts are inevitable, and well-designed nature-based solutions require a thoughtful and honest assessment of what can be achieved and sustained when faced with these future scenarios. This is critical to the ultimate performance and usefulness of nature-based solutions to society, including, most importantly, whether they truly support the communities they are designed to serve. To accomplish this, proponents of nature-based solutions should:

1. **Conduct a climate vulnerability assessment of target ecosystems in the design phase of project development,** incorporating local and traditional knowledge as well as technical estimates of ecosystem performance under extreme events and various climate scenarios. Policymakers can serve as a driving force by establishing risk screening as a prerequisite for the bilateral and multilateral agencies that fund nature-based solutions projects.

2. **Identify management options to ensure nature-based solutions produce the desired benefits under climate change in the short-, medium- and long-term.** In partnership with local stakeholders, conservation practitioners should: consider broad “no-regrets” approaches that boost the general resilience of an ecosystem; choose interventions that are locally appropriate and support community resilience while reducing pressure on ecosystems and their services; and favour prescriptive management approaches that prevent or minimise climate impacts to maintain ecosystem functions. Practitioners should also be prepared to shift project goals when interventions are unable to prevent or minimise climate threats to target species or ecosystems. For example, they can switch the focus of conservation efforts to more resilient species that fill a similar niche.

3. **Increase investment in monitoring the performance of nature-based solutions under climate change.** Data from weather stations, tide gauges, and other sensors combined with satellite imagery and other methods to regularly assess ecosystem conditions are essential to inform adaptive ecosystem management in a rapidly changing environment. The private sector, particularly tech companies, and local communities who can act as citizen scientists can work together to help fill critical gaps in monitoring capacity.

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THE UNIQUE CONTRIBUTIONS OF INDIGENOUS PEOPLES AND LOCAL COMMUNITIES TO NATURE-BASED SOLUTIONS

Authors: *Pablo Pacheco, Cristina Eghenter, Melissa De Kock, Delfin Ganapin, Elaine Geyer-Allély, Joost van Montfort and Fran Price*

The International Union for Conservation of Nature (IUCN) has developed a detailed set of eight criteria for actions to qualify as nature-based solutions, including one that acknowledges the importance of inclusive, transparent, and empowering governance processes[84].

This implies that nature-based solutions should nurture and prioritise actions that showcase the leadership, ownership and role of the Indigenous peoples and local communities (IPLCs) that have deep cultural attachment, customary custodianship and sustainable governance of their lands, waters and territories.

The role of IPLCs in meeting local and global societal challenges

Around the world, IPLCs have sustainably managed nature for generations in their "territories of life". A third (43.5 million square kilometres) of the world's land is governed by IPLCs under different types of statutory and customary ownership rights.[85] These lands and territories contribute to sustaining natural ecosystems including forests, mangroves, peatlands, grasslands and woodlands, small islands and coastal areas, and coral reefs. Forests conserved and sustainably used by IPLCs represent significant carbon stocks and hence help mitigate climate change. Similarly, in ocean and coastal areas, IPLCs engage in sustainable fishing practices that have prevented overharvesting and conserved unique marine biodiversity.

In total 91 per cent of IPLC lands are considered to be in good or moderate ecological condition, and the land controlled by IPLCs overlaps with 36 per cent of Key Biodiversity Areas.[86] About 2.5 billion women and men depend on community-based systems for their food, supplies, and livelihoods, out of which 370 million are Indigenous peoples.[87] They share vibrant and resilient cultures and rich traditional knowledge transmitted across generations.[88]

Yet, while IPLCs can be equally or more successful at safeguarding biodiversity than governments, they face critical economic and political challenges, including holding legal rights to a small proportion of the land they steward.[89] The lack of legal recognition of their lands undermines not only their ability to continue protecting nature but also their rights as peoples and communities. The failure to recognise these tenure rights, alongside social and political discrimination, has led to the encroachment of IPLCs' lands and territories by business interests and seekers of livelihoods, which has threatened their cultures and economies. Over 25 per cent of IPLC lands could face high pressure from development in the future.[90]

For example, in the Amazon, while Indigenous peoples have made progress in the recognition of their territorial rights, some are still struggling to formalize rights to their lands and

84 International Union for Conservation of Nature. 2020. *IUCN Global Standard for Nature-based Solutions*. IUCN. https://doi.org/10.2305/IUCN.CH.2020.08.en.

85 World Wildlife Fund et al. 2021. *The State of Indigenous Peoples' and Local Communities' Lands and Territories: A technical review of the state of Indigenous Peoples' and Local Communities' lands, their contributions to global biodiversity conservation and ecosystem services, the pressures they face, and recommendations for actions.* Gland, Switzerland. 63pp.

86 World Wildlife Fund et al. 2021. *The State of Indigenous Peoples' and Local Communities' Lands and Territories: A technical review of the state of Indigenous Peoples' and Local Communities' lands, their contributions to global biodiversity conservation and ecosystem services, the pressures they face, and recommendations for actions.* Gland, Switzerland. 63pp.

87 Oxfam, International Land Coalition and Rights and Resources Initiative. 2016. *Common Ground. Securing Land Rights and Safeguarding the Earth*. Oxfam: Oxford. 52pp.

88 ICCA Consortium. 2021. T*erritories of Life: 2021 Report.* 51pp.

89 Rights and Resources Initiative. 2015. *Who Owns the World's Land? A global baseline of formally recognized indigenous and community land rights.* Washington, DC, USA. 44pp.

90 World Wildlife Fund et al. 2021. *The State of Indigenous Peoples' and Local Communities' Lands and Territories: A technical review of the state of Indigenous Peoples' and Local Communities' lands, their contributions to global biodiversity conservation and ecosystem services, the pressures they face, and recommendations for actions.* Gland, Switzerland. 63pp.

territories. In spite of the acquired rights, some lands and territories are still under pressure from land speculators, illegal logging and mining operations. In other contexts, in Southeast Asia and Africa, the progress has been slower and IPLCs are at risk of being displace from their lands and livelihoods. Increasingly, IPLC leaders are acting as nature defenders and risking their lives.[91]

It is time for nature-based solutions to acknowledge that IPLCs are central to sustaining the diversity of life on Earth and to support fair and transparent mechanisms for sharing benefits.

IPLCs' contribution to nature-based solutions: rethinking nature

IPLCs rely on harmonious human-nature interactions to maintain lands, territories, and waters in good condition, with high biodiversity, forest cover, abundant fishing and hunting grounds. In many cases, they have invested their own knowledge, time, and resources with no external support to advance actions that achieve their own group societal goals - food security, human health or access to water - while protecting the environment and contributing to climate adaptation.[92]

While the global society benefits from these practices, IPLCs' achievements, together with their traditional knowledge and ability to live in balance with nature, have not been properly acknowledged and valued by the international community, including in negotiations and agreements on conservation and development.

While IPLC practices align with the overall goals of nature-based solutions, they operate under a fundamentally different view of nature. Nature-based solutions often consider nature as a separate entity from humanity, a technical "solution" that delivers goods and services to people. On the other hand, IPLCs view themselves and nature as intertwined, and part of an extended ecological family.

IPLCs can help to reframe nature-based solutions based on the following five unique contributions:

- **Holistic:** IPLC-led nature-based solutions can simultaneously address several societal challenges and ecosystem services (considering, for example, food security and climate adaptation together).
- **Legitimate**: Nature-based solutions in IPLC lands rely on locally-established authority systems with agreed customary norms and rules to access and manage land and natural resources.
- **Enduring:** IPLC-led nature-based solutions are embedded in communities' life plans and long-term resource management perspectives.
- **Culturally driven:** IPLC-led nature-based solutions acknowledge the interdependence between nature and social system and are guided by traditional knowledge.
- **Locally-owned:** IPLC-led nature-based solutions are inspired by values embedded in local authority systems and respond to specific conditions and needs.

Increasing IPLCs' involvement and leadership in nature-based solutions

The larger involvement of IPLCs in the implementation of nature-based solutions can leverage their unique contributions to achieve societal transformations. However, in order to facilitate IPLC participation in nature-based solutions, two enabling conditions must be pursued. First, nature-based solutions must be part of global efforts to shift economic and financial systems away from viewing nature as a commodity. Second, nature-based solutions should not only support IPLCs with well-functioning and preserved territories of life, but also empower those that are currently struggling to sustain their ways of life, cultures and economies. In those cases, IPLCs' local management systems are under threat due to market pressures, forest regulations not adapted to local contexts, and development projects.

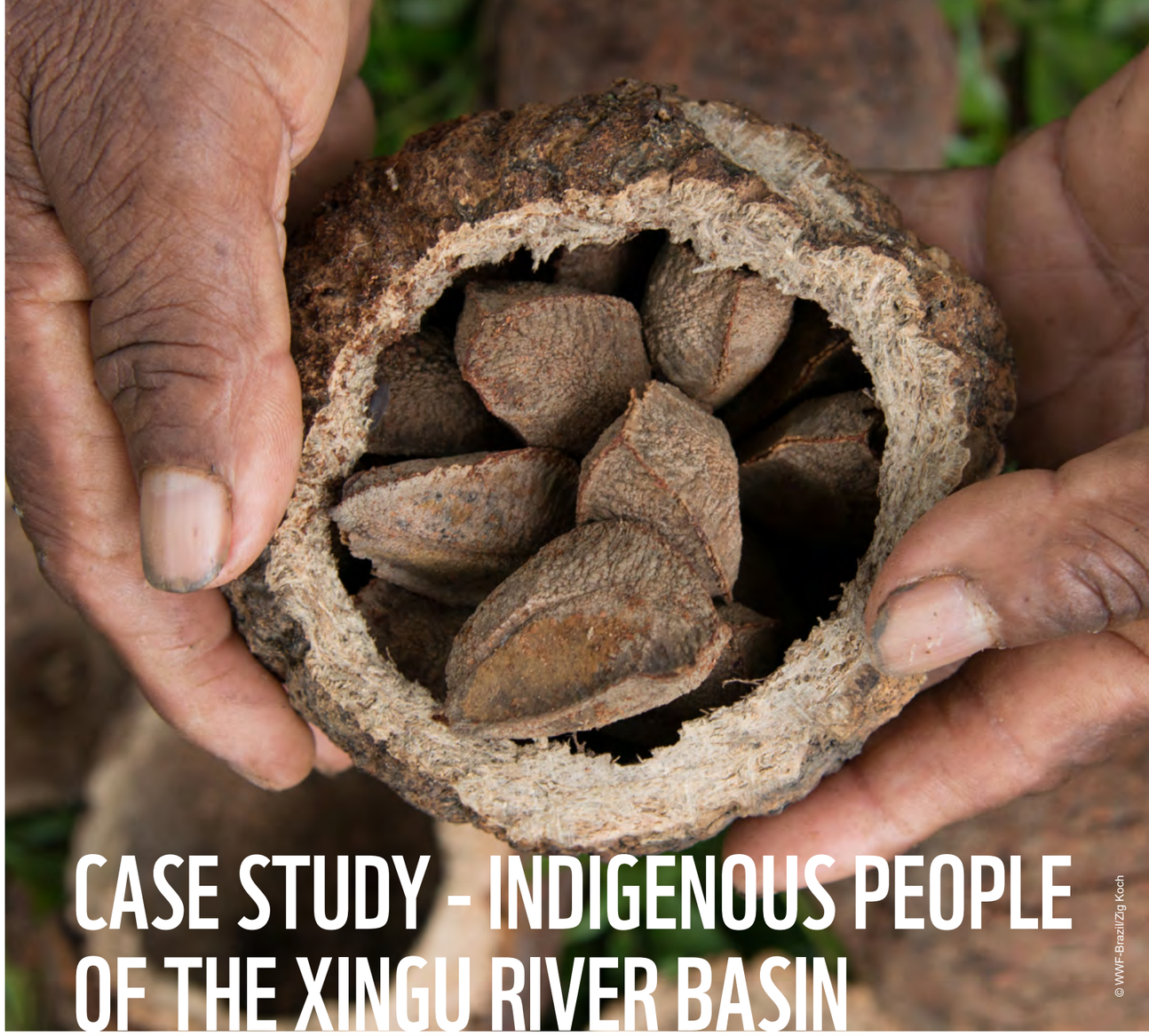
In particular, nature-based solutions should seek to expand IPLCs' capacity to: take greater control of their lands and territories; build horizontal partnerships with other actors; secure access to public and private financial resources; and remove legal barriers that discriminate against IPLCs. Support for strong local governance anchored in customary institutions and authority systems is critical to ensure that IPLCs are equitably given the benefits from the use of the forests they manage. Research in Mexico, Nepal and the Philippines has shown that success in managing forests while improving local livelihoods depends on the policy, market and institutional conditions in place.[93]

In addition, there are several initiatives in Latin America, sub-Saharan Africa, and Southeast Asia where communities are getting actively involved in forest restoration efforts and joining outside groups seeking to restore local ecosystems. These efforts require closer consideration as to what external support is needed to self-strengthen local processes that deliver positive social and environmental impacts. Further, to avoid initiatives labeled as nature-based solutions on IPLC lands and territories being controlled by external agents, Free, Prior and Informed Consent (FPIC) processes must be put in place along with equitable, fair and transparent benefit-sharing mechanisms.

91 Larsen, P. et al. 2020. *Understanding and responding to the environmental human rights defenders crisis: The case for conservation action*. Conservation Letters, 14:e12777. https://doi.org/10.1111/conl.12777.

92 ICCA Consortium. 2021. *Territories of Life: 2021 Report*. 51pp.

93 Baynes, J. et al. 2015. *Key factors which influence the success of community forestry in developing countries*. Global Environmental Change, 35: 226-238. https://doi.org/10.1016/j.gloenvcha.2015.09.011.



CASE STUDY - INDIGENOUS PEOPLE OF THE XINGU RIVER BASIN

In the Xingu river basin, in the Brazilian Amazon, the Kayapo indigenous people started defending their territory 40 years ago when ranchers, illegal loggers, gold miners and government-driven development projects placed pressure on their lands. The Kayapo gained formal recognition over almost 11 million hectares during the 1980s and 1990s.

They managed to protect these lands through traditional forest management practices and active patrolling. The Kayapo have established alliances with multiple NGOs to enforce their rights and strengthen their economies. Commercial activities linked to Brazil nuts, cumaru seeds, handicrafts, and recreational tourism provide income to the communities. They have established organisations such as *Associacao Floresta Protegida*, *Instituto Kabu* and *Instituto Raoni* to support their efforts to protect and manage their lands.[94] Today, the Kayapo territory is the last large tract of forest surviving in the southeastern Amazon and acts as a refuge for many species of animals and plants. The achievements are even more significant now as the pressures on protected areas in the Xingu region are growing, along with land conflicts.[95]

94 For more information about the initiative please refer to: https://kayapo.org/.

95 Xingu+ Network. 2021. Xingu under Bolsonaro: Xingu River Basin deforestation assessment (2018-2020). Near real-time deforestation radar monitoring system in the Xingu river basin. 47pp.

CASE STUDY - FOMMA IN NORTH KALIMANTAN, INDONESIA

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In North Kalimantan, Indonesia, the *Forum Musyawarah Masyarakat Adat Taman Nasional Kayan Mentarang* (FoMMA), a community-based organisation established in 2000, has documented the natural and social assets of 2 million hectares of indigenous territories. Since 2012, legislation has enabled new processes for recognising Indigenous peoples and customary forests.

FoMMA has led the registration of indigenous lands and forests with the support of other civil society organisations. In 2019, the first of eleven indigenous territories of 300,000 hectares in the Kayan Mentarang area was recognized by the local government in Malinau, followed by two additional customary lands in 2020 that cover a total of 800,000 hectares. These territories encompass connected forest blocks that mitigate climate change impacts.[96]

96 United Nations Development Programme (n.d.) Alliance of the Indigenous Peoples of the Kayan Mentarang National Park. Equator initiative. https://www.equatorinitiative.org/2020/06/04/forum-musyawarah-masyarakat-adat-taman-nasional-kayan-mentarang/. Accessed 25 Aug 2021.

CASE STUDY - LOCAL FOOD PRODUCTION IN THE HEART OF BORNEO

Food production is among the most important drivers of environmental degradation. In Borneo, a local nature-based solution led by Indigenous people protects food crops, cultural traditions, biodiversity and indigenous territories of life.

The "Heart of Borneo" refers to the main part of the island where forests remain intact. It is both a biodiversity hotspot and a source of livelihood for people. In this region, daily food not only comes from the cultivated rice fields and home gardens, but also from the forest and other "wild" areas. In the Heart of Borneo's Krayan Highlands, located at the border between Indonesia and Malaysia, the local people chose to protect the traditional cultivation area and surrounding territory as well as the knowledge associated with agricultural practices. They designated the Krayan Highlands as an area for organic and traditional agriculture to ensure food security and maintain crop diversity.[97]

In 2015, a community-based organisation representing the indigenous farmers of the Highlands in the Heart of Borneo was awarded the Equator Prize which recognises local sustainable development solutions for people, nature and resilient communities.[98] In 2019, the local government issued a decree to protect the indigenous farming system and agrobiodiversity.

Recommendations

Expand the recognition of IPLCs' territorial rights: governments should urgently recognise the lands and territories claimed by IPLCs since they may be at risk of being taken over by activities with negative impacts on nature.

Empower IPLCs and enhance local control: the legal and institutional barriers that prevent IPLCs from making their own decisions on the management of their resources must be removed. IPLCs must be able to participate in wider regional and national decision-making processes on nature-based solutions and have a voice in setting priorities and defining the societal challenges to address.

Build equitable partnerships with IPLCs: partnerships can enhance nature-based solutions by improving political support, defending land rights, resolving conflict, accessing data for monitoring resource use and facilitating impact investing. Collaborations must take place with the free, prior and informed consent (FPIC) of IPLCs in a manner that respects their self-determined priorities.

Invest in communities for sustainable livelihoods and economies: Nature-based solutions should stimulate investment opportunities while engaging with IPLCs. The IPLCs themselves increasingly demand economic viability for achieving their well-being.

Facilitate IPLC access to funding mechanisms: direct channels for accessing public and private finance resources should be available for IPLCs and avoid development and conservation organisations competing for the same funding as IPLCs. Transaction costs should also be reduced.

Elevate the voices of IPLCs into global discourses on nature-based solutions: international nature-based solutions forums where policy and practices are developed and agreed upon should facilitate access for IPLC representatives to speak about their knowledge, experiences, needs and priorities. Their voices must be heard to ensure that nature-based solutions not only consider the achievement of global societal challenges but also incorporate the fulfillment of local social, economic, health and cultural needs.

Enable the integration of IPLC knowledge and practices into nature-based solutions design and implementation: IPLCs members must be able to contribute traditional knowledge to balance the "western-centric" science that often drives nature-based solutions. Additionally they should be given the opportunity to play an active role in research, monitoring and the assessment of the effectiveness of nature-based solutions.

97 World Wildlife Fund. 2017. The Krayan Highlands in the Heart of Borneo. Forum of the Indigenous People of the High- lands of Borneo and WWF-indonesia. Indonesia.

98 United Nations Development Programme. 2018. Forum Masyarakat Adat Dataran Tinggi Borneo (FORMADAT), Borneo (Indonesia & Malaysia). Equator Initiative Case Study Series. New York, USA. 14pp.

FINANCING NATURE-BASED SOLUTIONS

Authors: *Margaret Kuhlow, Keiron Brand, Anna Kitulagoda and David McCauley*

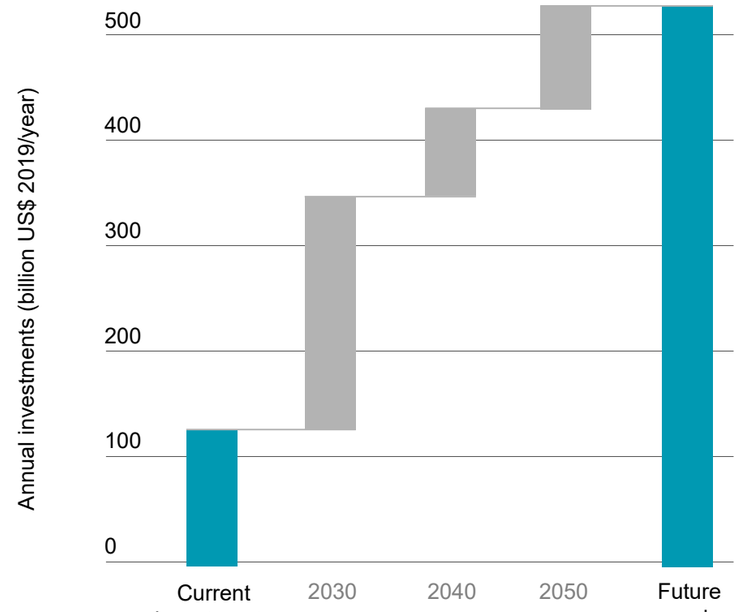
Finance is critical to unleashing the potential of nature-based solutions, and attracting it requires a significant shift in thinking and delivery.

The redirection of capital will require shifts in government as well as corporate policy to better reflect the real value of natural capital. Financial flows must be directed away from economic activities that undermine societal benefits derived from healthy ecosystems, while new financial mechanisms must be deployed to deliver nature-based solutions. Creating conditions conducive to investment in nature-based solutions is also crucial to unleashing their full potential. Specific attention is needed to understand the economic and financial dimensions of the societal benefits nature-based solutions offer as well as the cost-effectiveness of alternative approaches. Given the range of benefits nature-based solutions offer – from classic public goods to financial revenues more closely resembling traditional enterprise or infrastructure investments – both public and private finance can play a role.

The nature-based solutions finance gap

According to the UN Environment Program, there is currently roughly US$133 billion a year flowing into nature-based solutions, with an estimated annual gap of about US$536 billion per year and over US$4.1 trillion by 2050.[99] While this gap clearly cannot be filled by public finance alone, it is exacerbated by public incentives and financial flows that continue to support economic activities that damage nature.

Figure 7.1*. Nature-based solutions finance gap*



Note: These figures are taken from the model of Agricultural Production and its impacts on the Environment (MAgPIE v4.1), which was used to estimate investment need for forest-based nature-based solutions (which includes reforestation and afforestation cost estimates), and taken from separately estimated figures for silvopasture (planting trees on agricultural land), mangrove restoration and peatland conservation and restoration.

Source: UNEP-Vivid Economics, 2021[100]

The globalisation of finance has enabled exponential trade and economic growth that has connected countries, regions and continents, unlocking significant economic opportunities and innovations over the past century. However, development has occurred at the expense of the natural systems upon which societies depend, and the opportunity to build environmental and social resilience through investment in nature-based solutions has largely been missed. While there is a positive trend toward greater appreciation for, and investment in, nature-based solutions as cost-effective approaches to meeting societal needs, further progress is needed to create conditions conducive to greater investment in nature-based solutions.

One of the obstacles to deploying new private sector finance is the lack of investment opportunities or pipeline of financially viable “deals”. Many investors and financiers share the concern that nature-based solutions do not meet the investment criteria

99 United Nations Environment Programme. 2021. *State of Finance for Nature 2021*. Nairobi, Kenia. 60pp.

100 United Nations Environment Programme. 2021. *State of Finance for Nature 2021*. Nairobi, Kenia. 60pp.

of private finance due to lack of scale, unknown or undefined risks, low potential for risk-adjusted returns and longer-term payback periods. Part of this may be explained by a lack of private sector experience with nature-based solutions, which has traditionally been dominated by grant financing and donor-led groups and programs. Other reasons include: weak overall investment climates in places where opportunities for nature-based solutions exist; limited awareness of the role that nature-based solutions can play in climate investments, especially to capture the mitigation and adaptation benefits of maintaining or restoring forests and other ecosystems; policy disincentives including harmful subsidies and perverse tax incentives as well as legislative and regulatory barriers[101]; and weakly-formed and limited finance-friendly metrics to measure the performance of nature-based solutions interventions.

A pledge for purposeful investment in nature-based solutions

Public finance will continue to play a crucial role in ensuring that private investments are directed to the most ecologically and socially valuable places and interventions. In some cases, public investments will remain the foundation for nature-based solutions, especially where societal benefits are large but difficult to monetize. However, it is clear that public finance alone is insufficient to close the gap and it is essential to find ways to entice larger and well-targeted private capital flows towards nature-based solutions.

The need to mobilise private investment that makes a difference for nature and people is increasingly recognised, from the perspective of both risk and opportunity. On the risk side, in 2021 the WEF Global Risks Report identified environmental risks, including biodiversity loss and failure to take action on climate change, among the world´s top risks in terms of both their likelihood and impact.[102] WWF and PwC also highlighted the high stakes for the business community from biodiversity loss in their Nature, Too Big to Fail report.[103] On the opportunity side, the World Bank's Unlocking Finance for Nature and the Financing Nature report from The Nature Conservancy, Paulson Institute and Cornell University further elaborated both the needs and ways to mobilise capital towards nature-based solutions.[104,105] Public and philanthropic funding schemes now seek opportunities to facilitate private investments for nature-based solutions interventions. The inaugural One Planet Summit,[106] with its focus on addressing the global crisis of biodiversity loss, kick-started momentum for increased attention on the economic role of nature in early 2021. Organised by the French government, the UN, and the World Bank, the meeting catalogued a steady stream of commitments to "act in favor of biodiversity", including new pledges from the UK and France to direct 30 per cent of their overseas public climate funding to nature-based solutions.[107] Also, more than 50 countries joined together to form the High Ambition Coalition for Nature and People – also referred to as the Campaign for Nature[108] – to protect 30 per cent of the world's land and sea. COVID-19, and its environmental causes and impacts, gained attention in 2020. To have the solutions to such challenges, including a bold proposal for a Paris Agreement-style accord for biodiversity[109], through the Convention on Biological Diversity, and the opportunity to connect investments. The discussion is deepening and the COVID-19 recovery has made it all the more urgent.

As understanding of the role of nature in climate mitigation increases, and countries start to add nature-based solutions to their commitments under the Paris Agreement on climate change, appreciation for the importance of nature in helping maintain or build resilience to the physical, social, and economic ravages of climate change is rising. At the first global Climate Adaptation Summit, with over 30 world leaders and some 18,500 registrants from all sectors and geographies, UN Secretary General António Guterres highlighted the need to dramatically increase investment. Among the major initiatives highlighted was the recently launched Collaborative on Accelerating Investment in Adaptation and Resilience, an effort from Development Finance Institutions to increase public and private collaboration to address the critical challenge of climate adaptation, including with innovative and blended finance instruments and recognising nature-based solutions as an increasingly viable approach.

Bringing private finance to the table

Blended finance – the use of catalytic capital from public or philanthropic sources to increase private sector investment for sustainable development[110] – is one way to encourage increased private finance in nature-based solutions. On the supply side, the blended finance market has been experiencing consistent growth. Some Development Finance Institutions such as the Dutch Entrepreneurial Development Bank (FMO) have even started to develop blended finance instruments dedicated to supporting nature-based solutions.

101 BloombergNEF. 2021. *Climate Policy Factbook Three priority areas for climate action*. 34pp.

102 World Economic Forum. 2021. *The Global Risks Report 2021, 16th Edition*. Geneva, Switzerland. 96pp.

103 PricewaterhouseCoopers and World Wildlife Fund. 2020. *Nature is too big to fail – Biodiversity: the next frontier in financial risk management*. WWF-Switzerland. Zurich, Switzerland. 38pp.

104 World Bank Group. 2020. *Mobilizing Private Finance For Nature*. Washington, DC, USA. 110pp.

105 Deutz, A. et al. 2020. *Financing Nature: Closing the global biodiversity financing gap*. The Paulson Institute, The Nature Conservancy, and the Cornell Atkinson Center for Sustainability. 253pp.

106 For more information about the initiative please refer to: https://www.oneplanetsummit.fr/en.

107 Ministry for Europe and Foreign affairs. 2021. *Commitments to act in favor of biodiversity*. https://www.diplomatie.gouv.fr/en/french-foreign-policy/climate-and-environment/the-one-planet-movement/article/one-planet-summit-commitments-to-act-in-favor-of-biodiversity-12-jan-2021. Accessed 25 Aug 2021.

108 For more information about the initiative please refer to: https://www.theguardian.com/environment/2021/jan/11/50-countries-commit-to-protection-of-30-of-earths-land-and-oceans.

109 Taylor, K. 2020. *Biodiversity needs its own Paris Agreement, von der Leyen says*. Euractiv. https://www.euractiv.com/section/energy-environment/news/biodiversity-needs-its-own-paris-agreement-von-der-leyen-says/. Accessed 25 Aug 2021.

110 Convergence finance (n.d.) What is blended finance?. Online definition. https://www.convergence.finance. Accessed 25 Aug 2021.

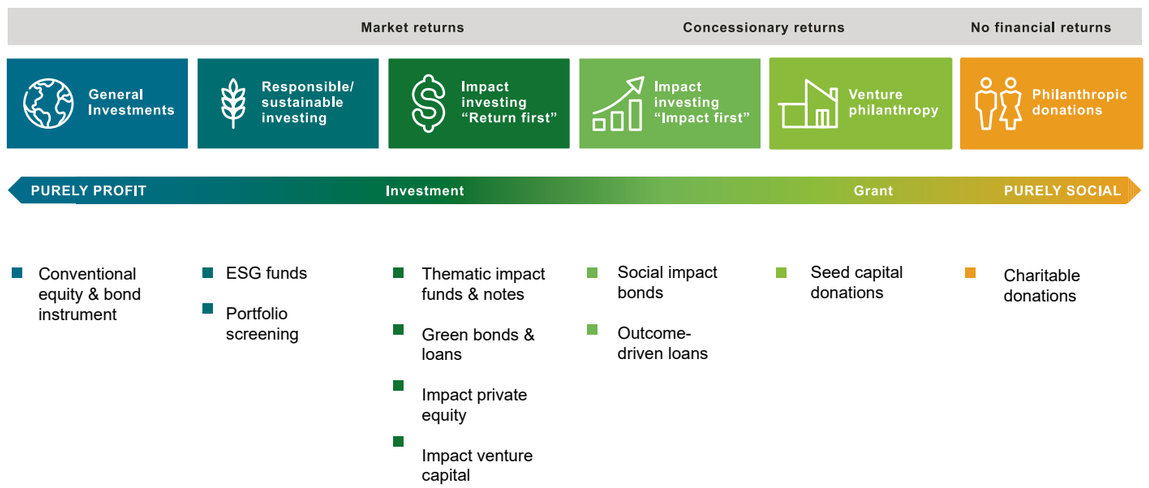
Another source of finance for nature-based solutions lies in the impact investment community.[111,112] Impact investing has traditionally been focused largely on social impact, but is increasingly looking for opportunities in environmental areas, with climate-related impact investing growing rapidly.[113] This includes both climate mitigation and adaptation investments. The latter are particularly needed, since even with widening availability of funds and interest from international financial institutions and impact investors, a pipeline of viable climate-resilient investments, including nature-based solutions, is needed if available capital is to be deployed utilising new instruments that focus on nature-positive investment. Recent initiatives include Terra Carta and the Natural Capital Investment Alliance, with founding partners Lombard Odier, HSBC Pollination Climate Asset Management and Mirova looking to mobilise US$10bn by 2022 for "natural capital themes across asset classes". To help guide such green-minded investors, a coalition of development agencies, UN agencies, academics, NGOs, and investors has launched the Little Book of Investing in Nature.[114] This collection of updates, analysis, and straight-forward guidance, combined with real-world examples, is accessible and practical.

Nature-based solutions also need the right partners to provide opportunities that have clear proof of concept, a proven track record, and a well-defined exit strategy, with patient capital and/or off-take agreements. Together with both public and private financial institutions, NGOs are well-placed to support this expansion in a variety of ways. Those with the requisite financial expertise and field experience can help originate and catalyse a healthy pipeline of bankable or investable nature-based solutions, applying their knowledge of environmental impacts and solutions as well as their experience working at land/seascape levels. NGOs can also help potential investors and financiers understand the opportunities presented by nature-based solutions. For example, NGOs have been particularly active in mapping and quantifying the economic and sometimes financial gains from maintaining or restoring healthy ecosystems such as forested watersheds, wetlands, grasslands, mangrove forests or coral reefs – providing a range of biodiversity conservation and climate adaptation benefits. Beyond a better understanding of the value, the work to make such projects "bankable" starts with being able to identify and define cash flow-generating activities and the value chains they follow. As an illustration, WWF has created an internal Bankable Nature Solution Network to originate and support financially viable projects which support the development of more climate-resilient and sustainable landscapes and economies that can be scaled and replicated, realising a wider positive impact on nature and communities.

Recommendations

1. **Recognise the value and select the right instruments:** There is a broad spectrum of potential financial viability among nature-based solutions and, as a result, the appropriate financial mechanisms also vary from purely profitable to the purely public grant-based and philanthropic. For fully bankable nature-based solutions, there is a wide range of investors and associated instruments that can potentially support them at various scales – from debt or equity financing to loan guarantees or even green bonds that cover sectors, landscapes, or regions. Increasingly, the structuring of investments for nature-based solutions seeks to target the financing type to the appropriate element of the solution (sometimes directly linked, in other settings running in parallel). For example, private financing is allocated to those aspects capable of generating financial returns and grant financing is made available either to: de-risk the design or implementation of private investments; or to cover those public goods dimensions that cannot be structured in a way to attract private capital.

Figure 7.2 *WWF Bankable Blueprint Book, based on "From philanthropy to ESG" by Credit Suisse.*



111 Global Impact Investment Network (n.d.) About impact investing. Online definitions. https://thegiin.org/impact-investing/. Accessed 25 Aug 2021.

112 Gregory, N. 2021. *Impact Investing — An Investment Approach that is ready for Prime Time*. International Finance Corporation. https://ifc-org.medium.com/impact-investing-an-investment-approach-that-is-ready-for-prime-time-47836cc77524. Accessed 25 Aug 2021.

113 Global Impact Investment Network. 2020. *Annual Impact Investor Survey*, 10th edition. 79pp.

114 For more information please refer to: https://www.afd.fr/en/ressources/the-little-book-of-investing-in-nature.

2. **Acknowledge the trade-offs:** Another important aspect of financing nature-based solutions is ensuring a full understanding of any tradeoffs between environmental, social or financial aspects. Traditionally, financial aspects get prioritised over others but nature-based solutions can have a broader group of beneficiaries that can make identifying costs, benefits and tradeoffs more complex. Understanding these trade-offs and how benefits can be shared will help to ensure more sustainable solutions – environmentally, socially and, ultimately, financially as well. The important role Indigenous peoples and local communities play in managing almost one-third of the planet's natural areas is another area that must receive a great deal more attention if nature-based solutions are to be socially viable, paving the way for new models of nature-positive resources management and locally driven entrepreneurship that learns from and builds upon respect for traditional rights and knowledge.

3. **Identify strong and clear metrics:** Identifying nature-positive investments, such as nature-based solutions, will require better metrics and clear and consistent disclosure – and there is progress afoot in this area. The International Business Council of the World Economic Forum, for example, has taken up work on Stakeholder Capitalism Metrics, engaging business leaders on standardised environmental and social impact measures. Auditors are also looking more closely at measurement of sustainability. The Global Public Policy Committee of the largest accounting firms has committed the group to assuring that the financial statements they audit incorporate material climate risks, and standards setters have announced the creation of a Sustainability Standards Board, starting first with climate. The UK and France have made the disclosure recommendations of the Task Force on Climate-related Financial Disclosures mandatory, with many other countries – including the US – indicating their intentions to do so. To enable the broadening of material risk and impact considerations from climate to include the loss of biodiversity, these efforts will be greatly enhanced by the new Taskforce on Nature-related Financial Disclosures (TNFD) as well as the Science Based Targets for nature, which are focused on identifying material metrics and measurement approaches for disclosure and target setting, respectively.

4. **Create more supportive policy:** The G7 countries are coming together behind developments like the TNFD, which should translate into specific policy measures that will level the playing field for businesses and investors to encourage a stronger flow of capital towards nature-based solutions in these countries and more widely. This will eventually cover institutions governing commodity and equity markets, and the Network for Greening the Financial System already includes financial regulators and central banks covering the majority of the global economy and nearly every member of the G20. This work must also extend to the rationalization of policy incentives that shape the market place, including the removal of harmful subsidies that encourage investments with negative consequences for climate or nature.

CASE STUDY - THE DUTCH FUND FOR CLIMATE AND DEVELOPMENT

The Dutch Fund for Climate and Development (DFCD) is an example of institutional collaboration that brings technical expertise together with public and private capital to invest in impactful climate adaptation and mitigation initiatives in developing countries.

A consortium between SNV Netherlands Development Organisation, WWF-Netherlands, the Dutch Entrepreneurial Development Bank and Climate Fund Managers runs the DFCD, which promotes a life cycle approach to allowing projects to grow and be technically and financially sound in order to obtain funding for full implementation. The SNV Netherlands Development Organisation and WWF-NL provide technical assistance for project development, while the Dutch Entrepreneurial Development Bank and Climate Fund Managers raise and provide funding through several instruments including grants, equity and debt.

The DFCD operates with three different facilities: the origination facility is intended to carry out project identification and feasibility activities to develop viable business cases. The two additional facilities (land use and water) target investments for projects that have graduated from the origination facility. To date, the DFCD has been able to mobilise EUR 500 million from private investors, helping to sustainably manage 100,000 hectares of forest and wetlands, reduce 40 million tonnes of greenhouse gases, and provide drinking water to 12.5 million people.[115]

This mechanism has proven to transform nature-based solutions into bankable projects. For example, Kelp Blue is an initiative in Namibia aimed at the commercial production of kelp from multiple offshore floating giant kelp forest farms. With an equity capital investment of US$2.4 million, this project tackles the societal challenges of food insecurity and climate change, while implementing sustainable practices over 820 hectares and creating 520 green jobs. A deep insight of case studies to date can be found in: Other successful case studies can be found in the Bankable Nature Solutions report.[116]

CASE STUDY - HSBC, WRI AND WWF CLIMATE SOLUTIONS PARTNERSHIP

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WWF has joined forces with HSBC and the World Resources Institute (WRI) to form the Climate Solutions Partnership. This five-year philanthropic collaboration aims to scale-up climate innovation ventures and nature-based solutions, and help transition the energy sector towards renewables, by combining resources, knowledge and insight. Together, with a network of local partners, the collaboration will help climate solutions scale into commercial reality with real-world impact.

The global initiative is powered by US$100 million of philanthropic funding from HSBC, allocated across three global themes over five years: climate-related innovation, nature-based solutions and energy efficiency initiatives within a variety of landscapes. The partners see these three areas as having potential for significant impact in a shared mission to achieve a net zero and climate positive and fair future.

Climate-related innovation: entrepreneurs and start-ups developing cleaner technology often struggle to access the networks, financial backing and business-to-business support required for success. The partnership will support efforts through mentorship, acceleration and scaling.

Nature-based solutions: the partnership seeks to build and scale the nature-based solutions marketplace by creating systemic infrastructure to reduce transaction costs and drive higher volumes of nature-based solutions activity.

Energy transition in Asia: Asia accounts for almost half of global energy demand. A successful energy transition from fossil fuels to renewables in this region is therefore critical to tackling climate change. Our projects in Bangladesh, China, India, Indonesia and Vietnam aim to shift the energy sector towards renewables and scale efficiency initiatives in key sectors such as healthcare, textiles and apparel.

115 Dutch Fund for Climate and Development. 2021. Key performance indicators. https://thedfcd.com/target-impacts/. Accessed 25 Aug 2021.

116 World Wildlife Fund. 2020. *Bankable Nature Solutions Report.* WWF-Netherlands. Zeist, Netherlands 155pp.

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THE ROLE OF INDICATORS TO MAXIMISE NATURE-PEOPLE-CLIMATE SYNERGIES

Authors: *Diego Portugal Del Pino and Jessica Zapata*

This chapter explores the contribution of indicators in accelerating such synergies, managing trade-offs and minimising collateral effects.

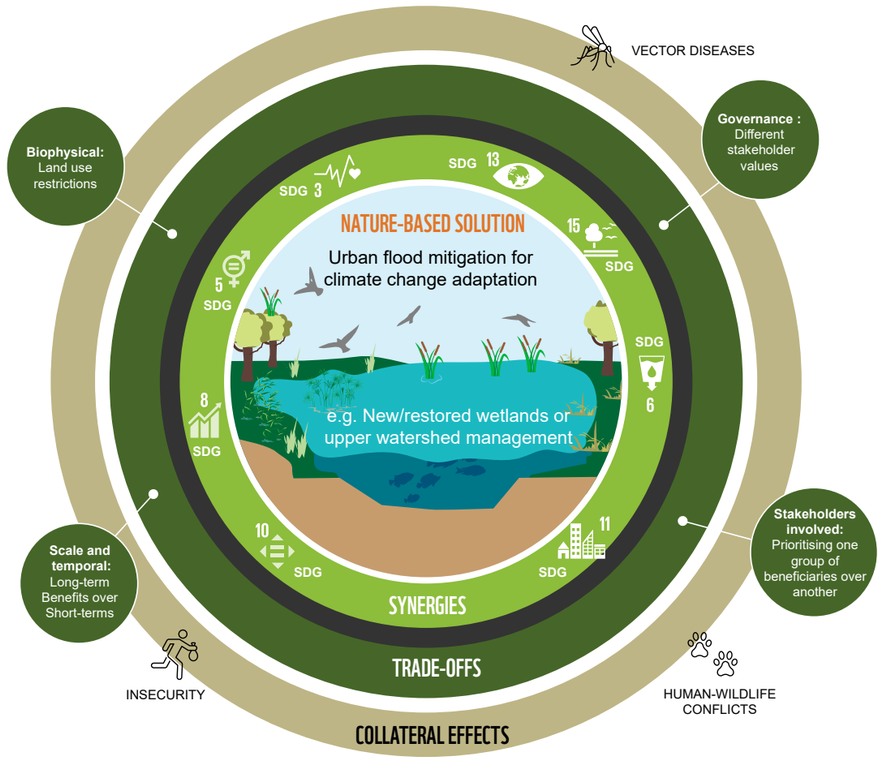
Nature-based solutions provide key benefits to overcome societal challenges and, by additionally ensuring a net local socioeconomic and biodiversity contribution, they constitute a fundamental pillar of sustained human well-being. This creates synergies which provide a triple win for people, nature and climate.

However, alongside synergies (i.e. win/win outcomes), trade-offs (i.e. win/loss outcomes) can arise and pose risks to the distribution of the quality and quantity of the benefits. Common understanding of trade-offs dictates prioritising one benefit in a given landscape to the detriment of another.

Nature-based solutions can also lead to collateral effects that emerge as a direct result of the intervention. Unlike trade-offs, collateral effects are unintended consequences rather than the process of prioritising one benefit over another. Figure 8.1 demonstrates a typical scenario faced by a decision-maker and exemplifies how the implementation of a nature-based solution can lead to different synergies, trade-offs, and collateral effects.

Failure to identify and minimise trade-offs and negative collateral effects may jeopardise the overall benefits of nature-based solutions. Any intervention must clearly weigh the costs and benefits as well as acknowledge the affected stakeholders in a transparent process.

Figure 8.1. *Synergies, trade-offs and collateral effects associated with a nature-based solution*



Urban flooding can be addressed in different ways, including nature-based and engineered solutions. The innermost concentric circle (green) shows the synergies created by nature-based solutions, represented by their contributions to the Sustainable Development Goals. In this case, nature-based solutions achieve multiple benefits in addition to addressing climate change and biodiversity, and usually deliver more than other types of interventions (i.e. pure grey infrastructure). Additional SDGs - 5, 8 and 10 - can also potentially be addressed through high-quality social standards. The second circle (dark green) shows the four types of trade-offs that can arise when a solution is being implemented. The outermost circle (in beige) shows collateral effects that may be unintentionally created as a result of the intervention.

Tracking the synergies produced by nature-based solutions

Nature-based solutions can deliver direct and indirect synergies for people, nature and climate. For example, the restoration of a riparian forest for water security can deliver additional benefits, such as providing a buffer against erosion and encouraging the return of pollinators. Synergies can be identified and tracked through the indicators that are already included in different international conventions (e.g. 2030 Agenda for Sustainable Development, Paris Agreement, First Draft of the Post 2020 Global Biodiversity Framework, or Sendai Disaster Risk Reduction Framework).

When evaluating the potential of nature-based solutions, decision-makers need clarity on the range of benefits that can be expected from the interventions. We propose a set of field-based indicators to assess the effectiveness of nature-based solutions in terms of the synergies they achieve for people, nature and climate. Specifically, the proposed indicators seek to demonstrate how nature-based solutions contribute to the 17 Sustainable Development Goals (SDGs) adopted by the United Nations General Assembly in 2015 and provide the basis for generating quantifiable data that can complement existing efforts such as the IUCN's global standard of nature-based solutions.[117]

In practice, nature-based solutions can advance the implementation of 12 SDGs and can contribute to at least 47 of the 169 targets of the 2030 Agenda for Sustainable Development.[118] While most contributions pertain to SDG 14 (life below water) and SDG 15 (life on land), other socio-economic SDGs – such as SDG 1 (elimination of poverty in all of its forms), SDG 2 (zero hunger), SDG 3 (good health and well-being), SDG 6 (clean water and sanitation), SDG 11 (sustainable cities and communities) and SDG 13 (climate action)- have also been identified as synergistic outcomes of nature-based solutions.

Additional synergies can be achieved but they depend on the governance structure of the intervention and the use of high-quality social standards such as the IUCN Nature-based Solutions Global Standards[119] and WWF's Environmental and Social Safeguards Framework[120]:

- SDG5 (Gender equality): nature-based solutions should not promote any form of discrimination based on gender.
- SDG8 (Decent work and economic growth): nature-based solutions must encourage entrepreneurship and job creation that guarantees fair income and safe working conditions.
- SDG10 (Reduced inequalities): nature-based solutions should strive for the social, economic and political inclusion and needs of all, regardless of age, gender, disability, sexual orientation, race, ethnicity, origin, religion, economic or other status.
- SDG16 (Peace, justice and strong institutions): nature-based solutions should enhance accountable and transparent institutions while ensuring responsive, inclusive, participatory and representative decision-making at all levels.

Assessing the potential trade-offs of nature-based solutions

Trade-offs or difficult choices can arise with the implementation of nature-based solutions which, by definition, require practitioners to define priorities. The analysis of such potential trade-offs and their impacts begins with proper identification.

Detecting trade-offs can be a delicate exercise as stakeholder groups may experience the costs and benefits of nature-based solutions differently[121]. The variation in perceptions is due to the fact that nature-based solutions involve complex interdependencies and operate under different time horizons and project scales, which means that trade-offs may not be immediately evident.

When considering nature-based solutions, practitioners should consider the range of difficult choices they may potentially be faced with. We have identified four main types of trade-offs that can arise during implementation[122]:

1. **Biophysical trade-offs**
   - Choosing between different societal challenges or between different ecosystem services. For example, practitioners may need to make a choice between restoration activities that act as barriers against climate-related hazards and production that secures food security; or between actions that safeguard nature and activities that promote economic growth. Usually, material uses of nature are more likely to lead to trade-offs.
2. **Governance-related trade-offs**
   - Choosing between science and local knowledge.
   - Involving partners with different values and acknowledging stakeholders with power to exert changes versus those who need to be empowered to make those changes.
   - Choosing the correct support instruments (financial tools based on monetary costs and income versus economic tools based on total costs and benefit flows);
3. **Temporal trade-offs**
   - Practitioners may consider short-term versus long-term benefits and the potentially difficult choices that are associated with operating at different time scales. For example, the decision-making process might take into account short-term jobs versus long-term, sustainable employment or significant upfront cost versus higher economic revenues at a later date.
4. **Scale-related trade-offs**
   - Global priorities (societal challenges) versus regional and local priorities. For example, a carbon mitigation project that benefits the global community should not compromise people at the local scale by neglecting their practices.
   - Choosing to protect one area over another. Practitioners may consider how the protection of a specific area might result in the displacement of environmental problems.
5. **Trade-offs involving different stakeholders**
   - Costs and benefits of nature-based solutions are experienced differently by stakeholders from diverse backgrounds (gender, ethnicity, age, etc.) and also when framed between present and future generations. Attention should be paid to the risk of prioritising benefits for specific groups, which may result in increased social inequalities.
   - Economic benefits versus cultural and other non-monetary benefits. For example, practitioners may be faced with choosing between higher operational and maintenance costs and more climate-resilient infrastructure.

Given the complexity and uncertainty of potential trade-offs, their effective management cannot be a one-fix-for-all and often requires a negotiation exercise between objectives and stakeholders. The following points can help manage and minimise those trade-offs. Specifically, practitioners should consider the following:

- Identify the decision-makers and the beneficiaries of a nature-based solution, how benefits are distributed and what the other options are.[123]
- Carefully consider the power relations at play and make decisions based on plurality of values and beliefs.
- Favour sociocultural benefits and their broad distribution over narrow monetary benefits, using social cost-benefit analysis.
- Understand that the choices made during the implementation of nature-based solutions are adaptive and should be reassessed on a regular basis.
- Promote multi and cross-sectoral decision-making spaces such as multi-stakeholder platforms to cultivate collective equity, fair and just consensus-building.[124]
- Support social agency to increase the wide acceptance of nature-based solutions.[125]

This framework may help practitioners gather all the information they need to achieve the most effective outcomes for all stakeholders. The implementation of landscape and seascape nature-based solutions hold particular promise to manage trade-offs and address the challenges associated with multiple scales.[126] Indeed, one of the core values of a landscape approach is to mobilise diverse stakeholders to work together on common solutions and shared goals.

Understanding collateral effects

Collateral effects consider all the potential negative consequences or ecosystem disservices[127] that may arise from nature-based solutions and that can harm biodiversity, the economy or human health[128]. Below, we summarize common collateral effects that may be expected from the implementation of nature-based solutions together with some preventive measures practitioners can adopt to minimise them.

COLLATERAL EFFECTS AFFECTING ECOSYSTEM STRUCTURES

- Bringing nature to cities or close to human settlements can invite all forms of biodiversity. While people may appreciate certain wildlife species such as birds, they may dislike others (e.g. snakes, spiders, large carnivores, rodents). It is vital to communicate the importance of all aspects of biodiversity and its wide contribution as a whole to human society.[129]
- The lack of wildlife diversity in a landscape and the overabundance of specific species can disrupt the integrity of the entire ecosystem. People may be affected as a result – for example, through the exacerbation of allergic pollen reactions due to wind-pollinated plants.[130]

117 International Union for Conservation of Nature. 2020. *IUCN Global Standard for Nature-based Solutions*. IUCN. https://doi.org/10.2305/IUCN.CH.2020.08.en.

118 United Nations. 2015. *Transforming our World: the 2030 Agenda for Sustainable Development*.

119 SDG5, SDG10 and SDG16 are mentioned in:*International Union for Conservation of Nature*. 2020. IUCN Global Standard for Nature-based Solutions. IUCN. https://doi.org/10.2305/IUCN.CH.2020.08.en. SDG8 is mentioned in: World Wildlife Fund and The International Labour Organization. 2020. Nature Hires report. 31pp.

120 For more information about the ESS framework please refer to: https://files.worldwildlife.org/wwfcmsprod/files/Publication/file/6djwt9h3e8_ESSF_Network_Implementation_11_2020.pdf?_ga=2.208181202.11999839.1629900576-1816907873.1629900576.

121 Galafassi, D., et al. 2017. *Learning about social-ecological trade-offs*. Ecology and Society, 22(1): 2. https://doi.org/10.5751/ES-08920-220102.

122 Types of trade-offs proposed by: Vasseur, L. and McElwee, P. 2021. 5th Dialogue - *Understanding and Improving Governance of Nature-based Solutions* [video]. https://www.youtube.com/watch?v=kVvKj3E9nx8&t=2s. Accessed 25 Aug 2021.

123 Gusenbauer, D. and Franks, P. 2019. *Agriculture, nature conservation or both? Managing trade-offs and synergies in sub-Saharan Africa*. IIED and Sentinel. 40pp.

124 Bowen, K. et al. 2017. *Implementing the "Sustainable Development Goals": towards addressing three key governance challenges—collective action, trade-offs, and accountability*. Current Opinion in Environmental Sustainability, 26–27: 90-96. https://doi.org/10.1016/j.cosust.2017.05.002

125 Wamsler, C. et al. 2020. *Environmental and climate policy integration: Targeted strategies for overcoming barriers to nature-based solutions and climate change adaptation*. Journal of Cleaner Production, 247: 119154. https://doi.org/10.1016/j.jclepro.2019.119154

126 García-Llorente, M. et al. 2015. *Biophysical and sociocultural factors underlying spatial trade-offs of ecosystem services in semiarid watersheds*. Ecology and Society, 20(3):39. http://dx.doi.org/10.5751/ES-07785-200339

127 Portugal Del Pino, D., Borelli S., and S. Pauleit. 2020. *Nature-Based Solutions in Latin American Cities*. In: Brears R.C. (ed) The Palgrave Handbook of Climate Resilient Societies. Palgrave Macmillan, Cham.

128 Döhren, P. and Haase, D. 2015. *Ecosystem disservices research: A review of the state of the art with a focus on cities*. Ecological indicators, 54: 490-497. DOI:10.1016/j.ecolind.2014.12.027

129 Maller, C. and Farahani, L. 2017. *Snakes in the city: understanding urban residents' responses to greening interventions for biodiversity*. RMIT University. Analysis and Policy Observatory. http://apo.org.au/node/178346

130 Döhren, P. and Haase, D. 2015. *Ecosystem disservices research: A review of the state of the art with a focus on cities*. Ecological indicators, 54: 490-497. DOI:10.1016/j.ecolind.2014.12.027

COLLATERAL EFFECTS AFFECTING ECONOMIC ACTIVITIES

- Nature-based solutions might require more regular maintenance and monitoring than traditional approaches, resulting in higher budgets. For example, the preservation of newly planted seedlings is a crucial but costly component of reforestation initiatives.
- The planting of the wrong species of trees can damage urban and rural environments, affecting pavements and roads. It is important to increase practitioners' technical knowledge to prevent structural damages. A solid planning process can also minimise future repair costs.[131]

COLLATERAL EFFECTS AFFECTING HUMAN HEALTH

- Nature-based solutions may lead to increased insecurity and criminality. Practitioners need to consider the safety and maintenance of nature-based solutions, especially in less affluent areas which are more likely to be impacted by higher crime rates.[132]
- Working with nature (e.g. trees and wildlife) may potentially expose people to risk. Practitioners should ensure they follow health and safety occupational guidelines.
- Nature-based solutions may increase water-borne vector diseases. For example, the creation of wetlands can support mosquito populations. Practitioners should consider wetland site selection accordingly and plan for environmentally friendly mitigation strategies to minimise or avoid potentially deleterious effects.[133]

Collateral effects are most likely to occur when there is a lack of understanding of the environmental, cultural and socio-economic conditions that govern landscapes. When local conditions are not adequately considered, nature-based solutions can indeed generate negative impacts on health (SDG3), gender equality (SDG5), economic growth (SDG8), sustainable and resilient communities (SDG11), or biodiversity and ecosystems (SDG14 and SDG15).

Recommendations

FOR PRACTITIONERS

1. Use field-based indicators to measure the impacts and track the progress of nature-based solutions against national and international commitments (Table 8.1). Use the IUCN Global Standard as a guide to prevent trade-offs and collateral effects.
2. Acknowledge that nature-based solutions may not always achieve a triple win for people, nature and climate but take all necessary steps to manage trade-offs and prevent collateral effects.
3. Choose landscape-scale nature-based solutions that can provide a solid understanding of the social, economic and environmental context and deliver multiple benefits for people and nature, while minimising trade-offs and collateral effects.

FOR DECISION-MAKERS

1. Build technical capacity to design, implement and monitor nature-based solutions.
2. Encourage the use of the IUCN Global Standard and field-based indicators to track progress toward global commitments such as the SDGs, NDCs, NBSAPs, etc.
3. While nature-based solutions are context-specific, their wide use in different regions may shed light on innovative implementation pathways. Sharing experiences and progress in a regional context can help identify common challenges, gaps, and best practices.

131 Escobedo, F. 2018. *Perceptions and effects of governance on ecosystem service and disservice provision in Bogotá, Colombia*. ECOSER.

132 Salbitano, F. et al. 2016. *Guidelines on urban and peri-urban forestry. Food and Agriculture Organization Forestry Paper*, 178. Rome, Italy.

133 Medlock, J.M. and Vaux, A.G. 2015. *Impacts of the creation, expansion and management of English wetlands on mosquito presence and abundance – developing strategies for future disease mitigation*. Parasites Vectors, 8: 142. https://doi.org/10.1186/s13071-015-0751-3.

***Table 8.1**. Field-based indicators to identify climate-nature-people synergies within nature-based solutions*

SOCIETAL CHALLENGE	FIELD-BASED INDICATOR[134]	SUPPORT TOWARDS			
		SUSTAINABLE DEVELOPMENT GOALS (SDG)	UNFCCC - PARIS AGREEMENT (PA)	CBD - THE POST 2020 GLOBAL BIODIVERSITY FRAMEWORK (GBF[135])	SENDAI DISASTER RISK REDUCTION (DRR) FRAMEWORK
Climate Change Carbon Mitigation	Hectares (terrestrial or marine) under improved and effective management that contributes to CO_2 emission reductions	SDG13 (13.2), SDG14 (14.2 and 14.5) and SDG15 (15.1, 15.2, 15.3, 15.4, 15.5)	PA - Article 5	GBF - Target 2 & Target 8	
	Tonnes of carbon reduced or avoided by restoration, management and/or conservation	SDG13 (13.2), SDG14 (14.5), SDG15 (15.1, 15.3 & 15.4)	PA- Article 5	GBF - Target 3 & Target 8	
Climate Change Adaptation and disaster risk reduction	Number of people (males and females) and/ or communities whose vulnerability is reduced or resilience is increased by adopting climate-resilient options (including fisheries, agriculture, etc.)	SDG1 (1.5), SDG2 (2.4), SDG3 (3.d), SDG5 (5.5 and 5.b), SDG8 (8.3, 8.5 and 8.9), SDG9 (9.3 and 9.4), SDG11 (11.1), SDG13 (13.1), SDG14 (14.b)	PA - Article 7	GBF - Target 4	SF -Target B, Target G & Priority 3 and 4
	Change in expected losses of lives and economic assets (US$) due to the impact of nature and climate hazards in the geographic area of the interventions	SDG1 (1.5), SDG3 (3.d), SDG13 (13.1 and 13.5)			SF - Target A, Target C & priority 3
	Quantity of urban/farms/floodplains/ river banks/other areas secured against hazards	SDG2 (2.4), SDG3 (3.d), SDG11 (11.5)	PA - Article 7		SF - Target D
	Reduction of disaster risks & impacts (i.e. flood peak & drought; coastal flood & erosion – wave heights and speed; less frequency of events; runoffs; sediment loss; fires incidence) to people and/ or infrastructure via different methods such as sustainable drainage systems; protection and restoration of floodplains, wetlands including saltmarshes, mangroves, corals; tree restoration in slopes	SDG1 (1.5), 3 (3.d), SDG11 (11.b)	PA - Article 7 and Article 8		SF - Target D & priority 3

134 Based on WWF experience and relevant information from:
1. Food and Agriculture Organization (2021). *Food and Agriculture Statistics*. http://www.fao.org/food-agriculture-statistics/en/#.YDL2i-hKjI. Accessed 25 Aug 2021.
2. Green Climate Fund. 2014. *Mitigation and adaptation performance measurement frameworks*. 10pp.
3. Global Environment Facility. 2019. *Guidelines on core indicators and sub-indicators*. 27pp.
4. Dinerstein, E. et al. 2020. *A "Global Safety Net" to reverse biodiversity loss and stabilize Earth's climate*. Science Advances, 6: 36, DOI: 10.1126/sciadv.abb2824
5. Kumar, P. et al. 2021. *An overview of monitoring methods for assessing the performance of nature-based solutions against natural hazards*. Earth-Science Reviews, 217: 103603. https://doi.org/10.1016/j.earscirev.2021.103603

135 1st Draft of The Post-2020 Global Biodiversity Framework https://www.cbd.int/doc/c/abb5/591f/2e46096d3f0330b08ce87a45/wg2020-03-03-en.pdf. Accessed 25 Aug 2021.

Food security	Area allocated for sustainable food production	SDG2 (2.4), SDG9 (9.4), SDG14 (14.7), SDG15 (15.2)		GBF - Target 5 & 9	
	Number of food secure people (males and females) and/or households. Including parameters such as average intake of dietary energy supply adequacy, number of undernourished people (male and females) reduced, diversification of crops	SDG2 (2.1 and 2.2), SDG5 (5.a)	PA - Article 2, 4 & Article 7	GBF - Target 9	SF - Priority 3
	Change in productivity or yields per area per season	SDG2 (2.3), SDG8 (8.1 and 8.3)		GBF - Target 5 & Target 9	
	Number of communities and/or farmers (males and females) adopting food security-related practices	SDG1 (1.5), SDG2 (2.2), SDG5 (5.a), SDG8 (8.2), SDG14 (14.b)	PA - Article 2 and Article 7	GBF - Target 9	SF - Target B & priority 3
Water Security	Quantity of water supplied or available due to water bodies (groundwater, aquifers, baseflow) restoration	SDG6 (6.3, 6.4 and 6.6), SDG15 (15.1)		GBF - Target 2, Target 3 & Target 11	
	Quantity of people (males and females) to have access to clean water	SDG1 (1.4), SDG3 (3.9), SDG6 (6.1)		GBF - Target 11	
	Number of conflicts due to water insecurity reduced	SDG6 (6.4), SDG16 (16.1)			
	Quantity of pollution (nutrients) and/or invasive alien species retained and/or filtered and/or removed (i.e. water quality improvement, soil moisture regulation)	SDG6 (6.3), SDG14 (14.1), SDG15 (15.8)		GBF -Target 6 & Target 7	
	Number of water ecosystems reconnected	SDG6 (6.6) SDG15 (15.1)		GBF - Target 3	
Human Health	Amount of polluted local air and water reduced	SDG3 (3.9), SDG6 (6.3), SDG14 (14.1)		GBF -Target 7 & Target 11	
	Degrees Celsius reduced due to intervention (reduction of urban heat island effect)	SDG1 (1.5), SDG3 (3.d), SDG11 (11.b), SDG13 (13.1)	PA - Article 7		
	Reduced injuries/fatalities and/or health-related diseases due to human-nature interactions	SDG3 (3.9), SDG8 (8.6), SDG11 (11.5 and 11.6) SDG12, SDG15		GBF - Target 4	
	Number of people who have access to safe, inclusive and accessible, aesthetic areas such as green and public spaces	SDG3 (3.9), SDG5, SDG11 (11.7)		GBF - Target 11 & Target 12	
	Number of square metres of public green area per inhabitant	SDG11 (11.7)		GBF - Target 12	
Net socioeconomic gain*	Quantity of people (males and females) and/or households whose income has increased, jobs were generated, or people have been trained	SDG1 (1.1), SDG5 (5.a), SDG8 (8.1, 8.3, 8.5, and 8.6), SDG9 (9.3), SDG14 (14.4 and 14.7)			
	Number of people (males and females) and/or communities to have increased livelihood diversification	SDG2 (2.5), SDG8 (8.2), SDG9 (9.b), SDG14 (14.7 & 14.b)	PA - Article 4 & Article 7	GBF - Target 5 & Target 10	SF - Target B & priority 3
	Average economic value for sustainable production of food (including fisheries) and/other non forest wood products	SDG2 (2.3), SDG14 (14.b), SDG15 (15.2)		GBF - Target 5, Target 9 & Target 14	
	Value in US$ of the conserved/restored ecosystems or ecosystem services provided.	SDG1 (1.1 and 1.2), SDG2 (2.a) SDG8 (8.1 and 8.2), SDG14 (14.4 and 14.7) SDG15 (15.4 and 15.5)		GBF - Target 10	
Net Biodiversity gain*	Value of species, ecosystems & genetics diversity (Shannon-Wiener diversity index; alpha, beta and gamma diversity), including keystone or flagship species.	SDG14 (14.5, 14.a and 14.c) SDG15 (15.1, 15.4, 15.5, 15.6 and 15.9)		GBF - Target 1 and Target 4	
	Number and size of biological corridors to enhance connectivity between landscapes and assist species movement	SDG15 (15.1, 15.4, 15.5, 15.6 and 15.9)		GBF - Target 2 and Target 3	
	Number and size of protected habitats that promote biological integrity (marine nurseries, microrefugia etc)	SDG14 (14.5, 14.a and 14.c) SDG15 (15.1, 15.4, 15.5, 15.6 and 15.9		GBF - Target 2 and Target 3	
	Number of ecosystems resilient to climate change and other threats (pest regulation, pollination, water and air regulation, soil formation, ocean acidification)	SDG14 (14.1, 14.2, 14.3, 14.4, 14.6, 14.a and 14.c) SDG15 (15.2, 15.3, 15.8 and 15.9	PA - Article 5 and Article 7	GBF - Target 5, Target 6, Target 7 and Target 10	

* All nature-based solutions must deliver a net socioeconomic benefits and a net biodiversity gain

Source: Authors.

CHAPTER 6

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REGIONAL AND NATIONAL POLICIES FOR SCALING NATURE-BASED SOLUTIONS: THE CASES OF COLOMBIA AND MALAYSIA

Authors: *Henry Chan, Lavanya Rama, Ximena Barrera, Mary Lou Higgins, Melissa Abud and Jessica Zapata*

National and regional policies play a critical role in fostering the systematic implementation of nature-based solutions, connecting individual projects and governance arrangements to achieve deep, cross-sectoral transformations across entire landscapes (see Chapter 1). Around the world, some countries have leveraged their policy, legal and institutional frameworks to support and scale-up nature-based solutions. Malaysia and Colombia, listed as two of the world's "mega-biodiverse" countries, are tangible examples of how policy provisions and regulatory instruments provide the enabling conditions to advance the execution of nature-based solutions.

MALAYSIA

Home to iconic wildlife species – including the Malayan tiger, the orangutan, and the Bornean elephant – Malaysia is one of the world's mega-biodiverse countries, it ranked 12th in the National Biodiversity Index[136]. Sabah and Sarawak, combined, host the richest rainforests on the planet and Malaysian waters host more than 77 per cent of the world's known coral species.[137]

Threats to biodiversity

Malaysia has undergone various stages of economic transition, and the country is dependent on natural resources as the basis for growth. Land-use change driven by agricultural conversion and the primary commodity sector has led to biodiversity loss, habitat destruction and fragmentation, and the exploitation of biological resources. Malaysia is the second largest global producer of palm oil, the most traded vegetable oil in the world. However, cultivation and production of the oil have caused deforestation, pollution, land degradation and human-wildlife conflict. Borneo, comprising the states of Sabah and Sarawak, as well as Brunei and five Indonesian provinces, has lost 47 per cent of its forests to palm oil in the last 20 years.[138]

Malaysia's policy commitment to biodiversity

At the Earth Summit in 1992, Malaysia made a historic pledge to maintain at least 50 per cent of the country's land mass under forest and tree cover. Three decades later, Malaysia has established several policies as well as enacted legislation to sustain that pledge. To date, 48 per cent of the country's land mass has been legislated as Protected Areas and Forest Reserves.[139]

Malaysia's first National Policy on Biological Diversity was formulated in 1998. In 2016 the country's commitment to biodiversity was strengthened with the launch of the National Policy on Biological Diversity 2016-2025, which serves as the national blueprint for biodiversity management in the country. Other policies relevant to the concept of nature-based solutions


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include the National Policy on Climate Change, the National Policy on Environment and the Forestry Policy.

The National Physical Plan draws upon the principles of these various policies and specifies the allocation of land uses in the country. The Plan is implemented through the Central Forest Spine Master Plan which identifies 37 wildlife corridors to restore connectivity (see Chapter 2).

In Sabah and Sarawak, the Heart of Borneo Initiative was signed by Brunei, Malaysia and Indonesia in 2007 and provides the framework for 22 million hectares of transboundary landscapes to integrate protected land, sustainable natural resource use and ecotourism. Under this initiative, large blocks of sustainable landscapes have emerged to connect several protected areas. Among these are: the Danum Valley, the Imbak Canyon and the Maliau Basin Conservation Areas in Sabah; the proposed Northern Connectivity Landscape project connecting Brunei to Sabah and North Kalimantan through northeastern Sarawak; as well as the Green Economy project area connecting the southern part of Sarawak and West Kalimantan.

Together, these policy provisions and regulatory frameworks provide the enabling conditions for the private sector and civil society to advance the implementation of nature-based solutions across Malaysia at a landscape level. Sabah's Jurisdictional Certified Sustainable Palm Oil Initiative and the Living Landscapes program illustrate how those elements can be achieved in a comprehensive manner.

136 Convention on Biological Diversity (n.d.) Malaysia - Country profile. https://www.cbd.int/countries/profile/?country=my. Accessed 27 Aug 2021.

137 Ministry of water, land and natural resources. 2019. *Sixth National Report of Malaysia to the Convention on Biological Diversity (CBD)*.

138 Ong, S. 2020. *Common ground. Can palm oil be sustainable?* World Wildlife Fund. https://www.worldwildlife.org/magazine/issues/winter-2020/articles/common-ground. Accessed 25 Aug 2021.

139 World Wildlife Fund. 2021. *Strategy 2021-2030 for People and Nature*. World Wildlife Fund Malaysia. 31pp.


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CASE STUDY - SABAH'S JURISDICTIONAL CERTIFIED SUSTAINABLE PALM OIL (JCSPO) INITIATIVE

In Sabah, palm oil is an important economic sector, supporting the livelihoods of thousands of people. However, it is associated with massive deforestation and loss of wildlife habitats. For example, Bornean elephants depend on connected forests to survive. The conversion of forests to plantations has separated the animals from their large foraging grounds, leading to increased conflict with humans due to the elephants damaging crops. Listed as endangered, almost all of Borneo's elephants are found in Sabah, where there are fewer than 1,500 individuals.

Despite the environmental cost associated with palm oil, it is a challenge to take away the production, especially as alternative oils would require even more land. Sabah has looked for ways to address this dilemma. For example, oil palm producer Sabah Softwoods worked with WWF-Malaysia and other neighbouring plantations to reduce human-elephant conflict. Solutions included aligning electric fences to protect young crops and facilitating migratory corridors for the elephants.

But wildlife species move across many sites and the State of Sabah acknowledged that to effectively address deforestation while protecting local livelihoods derived from palm oil production, a holistic land-use planning process was needed at a larger geographic scale. As a result, the state initiated the Jurisdictional Certified Sustainable Palm Oil initiative (JCSPO), a program supported by civil society that illustrates how nature-based solutions can be scaled, using the country's institutional and policy frameworks. The 10-year plan launched in 2015 aims to produce 100 per cent certified sustainable palm oil by 2025 and halt further deforestation. Under this scheme, 30 per cent of Sabah's land mass will be designated as permanently protected forests.[140]

The program adopts a pioneering jurisdictional approach that looks beyond individual plantations and strives for sustainability goals across the whole state. WWF-Malaysia's Living Landscapes program is contributing to this approach by bringing together diverse stakeholders in the key landscapes of Tawau, Lower Sugut and Tabin. Together, government agencies, businesses, local communities and NGOs identify which areas would be most suitable for production, protection or restoration activities across the entire landscape, and are looking to find a balance between conservation and sustainable production.

Beyond Sabah, it is the hope that this jurisdictional approach will become a microcosm of what WWF-Malaysia envisages Malaysia to become through the formulation of a 10-year strategy for 2021-2030, based on the three pillars of Protect, Produce and Restore.

140 World Wildlife Fund. 2021. Webinar: *The Living Landscapes approach: Progress and lessons from Sabah.* https://www.wwf.org.my/?28885/Webinar-The-Living-Landscapes-approach-Progress-and-lessons-from-Sabah. Accessed 25 Aug 2021.

COLOMBIA

Opportunities and challenges

From high mountains to mangroves and dense forests, including the Amazon, to open savannahs, Colombia is the most biodiverse country in the world in numbers of species per square kilometre[141]. It ranks first in the number of bird species, and second in plants, amphibians, butterflies, and freshwater fish. It is surrounded by oceans, and 41 per cent of the country is covered by the Amazon Biome. Colombia is home to half of the world's páramos, a unique High Andean ecosystem that serves as a buffer against climate change and water scarcity.[142] Watersheds supported by páramos and cloud forests provide water to 70 per cent of the Colombian population. Indigenous and afro-colombian communities have collective property over 35 per cent of the Colombian territory, and together they safeguard 51 per cent of the country's forests[143].

Despite this, 50 years of internal armed conflict[144] and an economy largely dependent on the exploitation of natural resources led to a 15 per cent loss of natural land cover during the second half of the 20th century[145]. In the last 40 years, Colombia lost nearly 7 million hectares of forest cover[146] and about 2.2 million hectares of wetlands.

With the loss of forests and wetlands, essential ecosystem services are gone, increasing the vulnerability of rural livelihoods that rely on healthy ecosystems. The combined pressures of climate change and human land use threaten the very existence of the páramos. The soils of this unique landscape are extremely dense in carbon, and the loss of the páramos' carbon storage capacity will likely lead to a net release of carbon into the atmosphere, further contributing to global climate change[147].

A policy commitment to biodiversity

To safeguard the unique biological diversity of the country, Colombia has adopted several ambitious commitments. The government has been consolidating a comprehensive environmental policy framework since 1974 with its first Natural Resources Code[148]. Colombia is a signatory to several international agreements including the Paris Agreement, the Montreal Protocol, the Convention on Biological Diversity, the Nagoya Protocol and the CITES Convention. The country is also part of international pledges, such as the Leaders' Pledge for Nature, the Trillion Trees Initiative and the Trondheim Call for Action in the Face of the Extinction Crisis.


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141 Convention on Biological Diversity (n.d.) Colombia - Country profile. https://www.cbd.int/countries/profile/?country=co. Accessed 27 Aug 2021.

142 nstituto Humboldt (n.d.) *Sistema de información sobre biodiversidad de Colombia*. https://cifras.biodiversidad.co. Accessed 25 Aug 2021.

143 Food and Agriculture Organization, United Nations Development Programme and United Nations Environment Programme. 2016. *Mapeo, caracterización y análisis de los pueblos indígenas, afrodescendientes y campesinos para la construcción de la estrategia nacional REDD+ en Colombia*.

144 Mining, along with illegal extraction of other natural resources, such as logging, was an important source of funding for illegal groups, and resulted in mercury contamination of rivers and land, deforestation and biodiversity loss.

145 World Wildlife Fund. 2017. *Colombia Viva: un país megadiverso de cara al futuro* - 2017. WWF-Colombia. Cali, Colombia. 162pp.

146 DEAM (n.d.) *Sistema de Monitoreo de Bosques y carbono*. http://smbyc.ideam.gov.co/MonitoreoBC-WEB/reg/indexLogOn.jsp. Accessed 25 Aug 2021.

147 Gutiérrez, J. et al. 2020. *Estimation of organic carbon in paramo ecosystem soils in Colombia*. Ecosistemas 29(1): 1855. https://doi.org/10.7818/ECOS.1855.

148 Global Recovery Observatory. 2017. Colombia – Country Profile. UNEP and GIZ. https://greenfiscalpolicy.org/policy_briefs/colombia-country-profile/. Accessed 25 Aug 2021.


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Colombia and nature-based solutions

Although there is no mention of "nature-based solutions" in Colombian legislation to date, the government has four major policies that chart the country's path to tackle the challenges of nature conservation, climate change, and sustainable development. Together, these national policies and plans can foster the systematic implementation of nature-based solutions at scale.

The National Policy for Biodiversity and Ecosystem Services Management (PNGIBSE) seeks to maintain and improve the adaptive resilience of socioecological systems at different scales through coordinated work among diverse stakeholders[149]. The nature-based solutions approach is suited to meet the policy's ambitious targets through the restoration of natural areas, the removal of invasive species, and the implementation of sustainable production systems in every highly biodiverse municipality affected by the armed conflict.

The Climate Change Law and the Nationally Determined Contribution (NDC)[150] under the Paris Agreement reflect Colombia's commitment to achieve a 51 per cent reduction in emissions by 2030. This can only be accomplished if deforestation rates decline substantially and at least one million hectares of natural ecosystems are restored. The Colombian NDC acknowledges the role nature-based solutions can play in conserving and restoring strategic ecosystems such as páramos, mangroves, wetlands, coral reefs, and tropical forests for their intrinsic value and the environmental services they provide.

The Green Growth Policy was adopted by the government of Colombia in 2018 with three objectives: to generate conditions that promote new economic opportunities based on natural capital; to strengthen mechanisms to optimise the use of natural resources and energy in production and consumption; and to promote the capacity of science, technology and innovation that support green growth. Colombia acknowledges the potential of nature-based solutions to accelerate the country's green development path and to achieve efficiency in public spending[151].

The Policy for Sustainable and Inclusive Recovery, Repowering, and Growth, adopted in 2021, prioritises nature-based solutions, accelerates the planting of 180 million trees and provides incentives for communities to engage in silvo-pastoral production and agroforestry activities.

149 Ministerio de Ambiente y Desarrollo Sostenible. 2017. *Plan de acción de biodiversidad para la implementación de la Política nacional para la Gestión integral de la biodiversidad y sus servicios ecosistémicos* 2016-2030.

150 Ministerio de Ambiente y Desarrollo Sostenible. 2020. *Actualización de la NDC de Colombia*.

151 Departamento Nacional de Planeación. 2020. Foro: *Potencial de las soluciones basadas en la naturaleza para la reactivación económica*. https://colaboracion.dnp.gov.co/CDT/Prensa/Presentaciones_Foro_SbN.pdf. Accessed 25 Aug 2021.

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CASE STUDY - HERENCIA COLOMBIA, A NATIONAL COMMITMENT TO MULTIPLE NATURE-BASED SOLUTIONS

Herencia Colombia (HECO) was initiated after an agreement between the government of Colombia and several NGOs[152] was signed at COP21 in 2015. HECO is a conservation financing project designed to strengthen the capacity of Colombia's natural landscapes by: increasing the amount of land in the protected areas system; ensuring the proper management and governance within and adjacent to protected areas; and reducing deforestation in the surrounding landscapes. The project also seeks to promote climate-smart economic alternatives and to secure the financial sustainability of the National System of Protected Areas (SINAP) and other long-term conservation strategies adopted by the country[153].

Specifically, HECO aims to conserve 20 million hectares of land and support the implementation of multiple nature-based solutions that follow an ecosystem-based adaptation approach. Nature-based solutions focus on ecological restoration, soil management, agroforestry, forest protection, and silvopastoral systems in priority landscapes such as the Andes, the Orinoquía, the Amazon and the Pacific.

Herencia Colombia is not only an example of collaboration between government entities and civil society stakeholders but it is also fully integrated within Colombia's national policies. HECO was included in the National Development Plan 2018-2022[154] as a priority to position biodiversity through the consolidation of SINAP and other strategies of importance for conservation. Likewise, HECO will contribute to the implementation of the SINAP policy[155] and will rely on the country's Green Growth Policy to make an impact on the landscapes where productive activities are carried out by several economic sectors.

152 The Ministry of Environment and Sustainable Development, Natural National Parks Directorate, the Gordon Foundation and Betty Moore, the Natural Heritage Fund, WWF, WCS and Conservation International.

153 World Wildlife Fund. 2018. *Herencia Colombia: la gran apuesta colombiana para un nuevo acuerdo por el bienestar de la naturaleza y las personas*. https://www.wwf.org.co/?uNewsID=339032. Accessed 25 Aug 2021.

154 Roadmap that establishes government objectives, setting programs, investments and goals for the four-year period.

155 This policy will be implemented over a 10-year time horizon (2021-2030) and includes specific cross-sector actions led mainly by National Natural Parks of Colombia,

Recommendations for policy makers:

In order to unleash the full potential of nature-based solutions, policy makers should:

- Define a portfolio of nature-based solutions that are adapted to the national context and which can be included in specific climate, nature or development policy instruments such as NDCs.
- Promote meaningful partnerships between public, private and civil society stakeholders around strategic landscapes to jointly implement context-specific nature-based solutions with a common and long-term vision.
- Mobilise and allocate sufficient resources beyond environmental institutions' budgets to support nature-based solutions across sectors.
- Increase and mainstream nature-based solutions within national governance frameworks and climate action policy instruments, including NDCs, long-term strategies, national development plans, and business plans.
- Scale-up nature-based solutions across large landscapes to achieve climate mitigation, resilience and adaptation while securing people's livelihoods and ending biodiversity loss.

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FOSTERING ALIGNMENT, CONVERGENCE AND INTEGRATION AMONG THE INTERNATIONAL ENVIRONMENT CONVENTIONS THROUGH NATURE-BASED SOLUTIONS

Authors: *Gavin Edwards, Manuel Pulgar-Vidal, Lin Li and Vanessa Morales*

The emergence of international policy frameworks

In response to growing environmental concerns in the 1960s and 70s, governments started to develop issue-specific policies, such as the Clean Air and Clean Water Acts in the US and UK or the US Endangered Species Act. Decades later, with a better scientific understanding of causes and potential consequences of the problem and institutions such as the United Nations Environment Programme (UNEP) leading the international discussions, world leaders acknowledged in 1992 at the Rio Earth Summit that the accelerating decline of Earth's resources driven by humanity's unsustainable way of living had to be addressed.

That year, the UN Framework Convention on Climate Change (UNFCCC) was adopted and the Convention on Biological Diversity (CBD) was submitted for governments´ sign-off. Following these, specific policy tools were developed to address environmental problems at a global scale.

Current Challenges

Fast forward to the present, while we see some progress towards meeting the goals of these conventions, the overall impact on environmental and social indicators remains bleak. Our planet is heading towards a biodiversity collapse and a sixth mass extinction, species are going extinct 1000 times faster than natural extinction rates[156] and we are on a path to exceed 1.5ºC of global warming within the next two decades[157], which guarantees we will face more dangerous and destructive extreme weather events than we currently are. Temperature has been rising at an unprecedented rate in the last decades, increasing hot extremes, heavy precipitation, and agricultural and ecological drought in several regions across the world[158]. Water is increasingly in demand and yet less available, with around 80 per cent of industrial and municipal wastewater discharged into the environment without treatment[159]. Additionally, between 8-45 per cent of ice-free land has been degraded globally[160].

The way we produce and consume are the main drivers of these changes – and are putting at risk almost every living thing on earth, especially us: humans; our lifes, livelihoods and assets. About 25 per cent of the world's population struggles to eat safe, nutritious and sufficient food[161]. The displacement of at least 28 million people (more than twice as those caused by conflict and violence) was triggered in 2020 by climate-related extreme events[162], and around 1 million people die each year as a result of unsafe drinking-water and poor sanitation[163].

We know these crises are intertwined and connected: a failure to jointly address climate change and biodiversity loss

156 De Vos, J. et al. 2014. *Estimating the normal background rate of species extinction*. Conservation Biology, 29(2): 452-462. https://doi.org/10.1111/cobi.12380

157 Intergovernmental Panel on Climate Change. 2021. *Summary for Policymakers*. In: Masson- Delmotte, V. et al. (eds). *Climate Change* 2021: *The Physical Science Basis*. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press. In Press.

158 Intergovernmental Panel on Climate Change. 2021. *Summary for Policymakers*. In: Masson- Delmotte, V. et al. (eds). *Climate Change 2021: The Physical Science Basis*. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press. In Press.

159 World Water Assessment Programme. 2018. *The United Nations World Water Development Report 2018: Nature-Based Solutions for Water*. United Nations Educational, Scientific and Cultural Organization. Paris, France. 139pp.

160 Olsson, L., et al. 2019. Land Degradation. In: Shukla, P.R. et al. (eds). *Climate Change and Land: an IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems*. Intergovernmental Panel on Climate Change, pp 345-436.

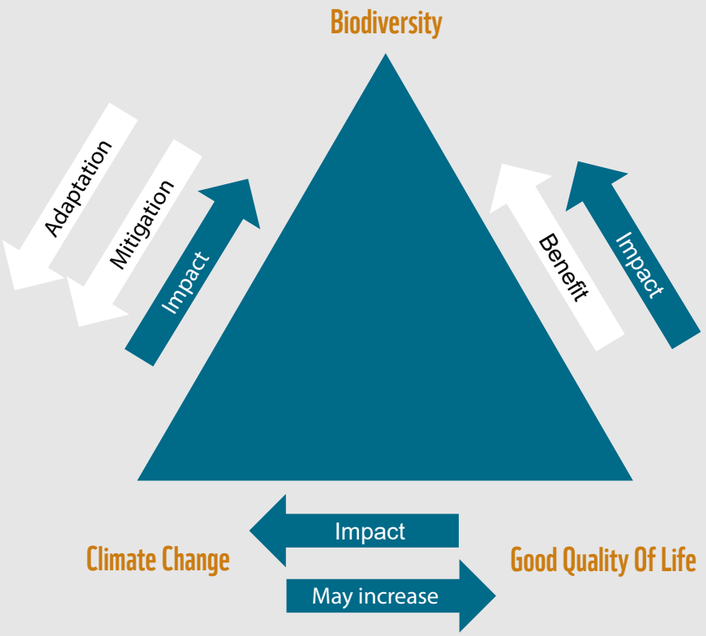
161 Food and Agriculture Organization, et al. 2019. *The State of Food Security and Nutrition in the World 2019*. Safeguarding against economic slowdowns and downturns. Rome, Italy. 212pp.

162 Internal Displacement Monitoring Centre. 2020. Global internal displacement database. Link. Accessed 25 Aug 2021.

163 World Health Organization. 2019. Drinking water. Link. Accessed 25 Aug 2021.

compromises people's quality of life[164]. They share some root causes and reinforce each other, accelerating and/or deepening the negative trends that they represent. This has been recently acknowledged in the Intergovernmental Platform on Biodiversity and Ecosystem Services - Intergovernmental Panel on Climate Change (IPBES-IPCC) Biodiversity and Climate Change Report[165] and the IPCC Special Report on Climate Change and Land[166]. Both stressed: i) the role of climate change as a direct driver of biodiversity loss, land degradation and food insecurity; and ii) the role of ecosystem loss and land degradation as a significant source of greenhouse gas emissions. Therefore, international agreements focused on one or a few specific issues will not be able to provide a complete and durable solution for people, climate and nature.

Figure 10.1. *Relationships between climate change, biodiversity and good quality of life*



Relationships between climate change, biodiversity and good quality of life.

Blue arrows represent interactions that are predominantly threats, white arrows predominantly opportunities. Modified from Korn e*t al*. (2019).

Source: IPBES-IPCC co-sponsored workshop report on biodiversity and climate change[167]

Protecting biodiversity, avoiding dangerous climate change and promoting an acceptable and equitable quality of life for all is the mandate of several global initiatives, particularly the Strategic Plan for Biodiversity 2011-2020 of the CBD, and the Paris Agreement to the UNFCCC and the UN Sustainable Development Goals (SDGs).[168]

Several solutions to the challenges are known, tested and proven to be effective – sustainable agriculture and fisheries, ecosystem restoration, renewable energy systems and the electrification of transport are just some of the many examples. But current environmental trends indicate that none is yet being implemented at a scale to match the size of the challenge they seek to address. Overcoming this barrier demands cooperation among economies and requires world leaders to step up to scale solutions much more quickly. As our collective footprint begins to surpass planetary boundaries, we now have very little time to act.[169] We are in the decisive decade, with a high chance of exceeding tipping points (e.g. sea level rise due to collapsing ice sheets or ocean circulation changes) and we require rapid transformational change to limit warming to 1.5°C by the end of the century and reverse the accelerated rate of nature loss, if we are to achieve a safer world.

164 Pörtner, H.O., et al. 2021. IPBES-IPCC co-sponsored workshop report on biodiversity and climate change. Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services and Intergovernmental Panel on Climate Change. 23pp.

165 Pörtner, H.O., et al. 2021. IPBES-IPCC co-sponsored workshop report on biodiversity and climate change. Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services and Intergovernmental Panel on Climate Change. 23pp.

166 Intergovernmental Panel on Climate Change. 2019. Summary for Policymakers. In: *Climate Change and Land: an IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems*. 36pp.

167 Pörtner, H.O., et al. 2021. IPBES-IPCC co-sponsored workshop report on biodiversity and climate change. Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services and Intergovernmental Panel on Climate Change. 23pp.

168 Anon. 2021. Scientific Outcome of the IPBES-IPCC co-sponsored workshop on biodiversity and climate change. https://ipbes.net/sites/default/files/2021-06/20210609_scientific_outcome.pdf. Accessed 25 Aug 2021.

169 Leclère, D. et al. 2020. *Bending the curve of terrestrial biodiversity needs an integrated strategy*. Nature, 585: 551–556. https://doi.org/10.1038/s41586-020-2705-y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The benefits of alignment and integration among UN Conventions and within governments through nature-based solutions

As mentioned, multilateral environmental agreements were designed to bring a more focused approach to addressing specific challenges. For example, many governments are restructuring their electricity sector to stimulate the growth in renewable energy as a way of achieving the emission targets set as part of their commitments through the Climate Convention. The same is true for the Convention on Biological Diversity, which encouraged governments to extend, designate and manage numerous new protected areas over the past decade.[170]

However, when governments focus on individual issues, they often overlook the synergies that can be achieved and also potential tradeoffs when addressing three intertwined global crises: biodiversity loss, climate change and equitable development. In contrast, solutions such as halting tropical deforestation in the Brazilian Amazon or rainforests of Sabah can drive down greenhouse gas emissions, while also ensuring indigenous communities and species such as jaguars and orangutans can thrive.

Nature-based solutions, as defined by the International Union for Conservation of Nature (IUCN), embrace high-priority intertwined actions that have existed for decades[171] but only recently have been recognised for their capacity to tackle several societal challenges, delivering biodiversity net gain while ensuring ecosystem integrity and providing multiple co-benefits. Healthy ecosystems are essential to achieving the objectives of the UNFCCC, given their capacity for long-term carbon sequestration/capture and storage and avoiding further emissions to the atmosphere, as well as their impact on the nitrogen and water cycles. The CBD also needs to ensure there is biodiversity net gain, which contributes to ecosystem integrity, in every intervention on nature.

For example, a study that considers how the transformation of the land sector can help achieve the Paris Agreement's goal of limiting warming to 1.5°C above pre-industrial levels found that "deploying measures in agriculture, forestry, wetlands and bioenergy could feasibly and sustainably contribute up to 30 per cent, or 15 billion tonnes of carbon dioxide equivalent ($GtCO_2e$) per year, of the global mitigation needed in 2050".[172] Most of these measures are nature-based solutions that can help stem the extinction crisis, safeguard water and food supplies and reduce the risks of future pandemics. Without these interventions, the Paris Agreement's goals become further out of reach and since climate change represents the biggest long-term threat to biodiversity[173], the

170 Secretariat of the Convention on Biological Diversity. 2020. *Global Biodiversity Outlook* 5. Montreal, Canada. 208pp.

171 Intergovernmental Panel on Climate Change. 1992. Climate Change: The IPCC 1990 and 1992 Assessments.

172 Roe, S., et al. 2019. *Contribution of the land sector to a 1.5°C world*. Nat. Clim. Chang. 9, 817–828. Available: https://doi.org/10.1038/s41558-019-0591-9

173 Intergovernmental Panel on Climate Change. 2014. Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

CBD's objectives could not be met either if action to significantly drive down greenhouse gas emissions fails.

During 2021, the leaders of the Group of Seven (G7) countries recognised the threat that the "interdependent crises of climate change and biodiversity loss" pose to human society and the necessity to '...not only become net zero but also nature-positive'. The Communiqué from the G7 Ministers of Environment stressed "the crucial role of nature-based solutions in delivering significant multiple benefits for climate mitigation and adaptation, biodiversity, and people and thereby contributing to the achievement of various Sustainable Development Goals (SDGs)... Nature-based solutions can also provide sustainable livelihoods through protecting and supporting a wide range of ecosystem services on which the world's most vulnerable and poorest people disproportionately rely". Therefore, the G7 leaders committed "to strengthen their deployment and implementation… stressing that nature-based solutions do not replace the necessity for urgent decarbonisation and reduction of emissions but are needed alongside these efforts". Through the Nature Compact[174], they committed to increase finance for nature-based solutions that enhance synergies between climate and biodiversity, and welcomed all efforts that Multilateral Development Banks can make to scale-up this purposeful funding.

If nature-based solutions are scaled quickly and adequately financed, they can deliver multiple shared benefits:

- **Efficiency:** Nature-based solutions can simultaneously address multiple climate, sustainability and societal challenges, making them inherently efficient. For example, solutions that aim to protect and restore mangroves not only address climate change but also deliver multiple benefits for coastal human communities.[175]

- **Integrated government response:** Nature-based solutions can help governments adopt a whole-of-government approach to address the far-ranging impacts on the economy and human well-being. It is increasingly recognised that climate change cannot be addressed solely by Environment Ministries and that governments must facilitate the involvement of multiple ministries and agencies to scale climate solutions faster, including finance, agriculture and economy ministries. For example, Germany's EnergieWende (Energy Transition) aims to transform the energy sector to become strongly reliant on renewable energy resources and to reduce greenhouse gas emissions by 80-95 per cent by the year 2050. This joint initiative of the German Federal State and the 16 German regions (Länder) demonstrates how a whole-of-government approach has enabled the country to achieve a more rapid scaling of renewable energy technologies.[176]

  At the international level, the Leaders' Pledge for Nature[177] provides an opportunity to create an integrated response to reverse biodiversity loss by 2030 and align governments internally to do so. Leaders committed to "...ensuring that across the whole of government, policies, decisions and investments account for the value of nature and biodiversity…". They also committed to mainstreaming biodiversity into relevant sectoral and cross-sectoral policies at all levels, including sectors such as food production, agriculture, fisheries and forestry, energy, tourism, infrastructure and extractive industries, trade and supply chains. In addition, they committed to aligning financial flows with this goal by incentivizing green investments but also by withdrawing harmful subsidies.

- **Fostering alignment** between climate and biodiversity through the alignment of Nationally Determined Contributions (NDCs) with the commitments under the Global Biodiversity Framework, and especially National Biodiversity Strategies and Action Plans (NBSAPs). This can include identifying efficiencies in reporting across the Conventions.

Of course nature-based solutions cannot solve all the challenges we face. But using ecosystems to facilitate the alignment between the climate and biodiversity processes, nature-based solutions can greatly contribute to addressing many of the challenges and provide a range of benefits. So far, the scaling of nature-based solutions has been too slow and investment too limited, as explained in Chapter 7.

Considering the current evolving global trends that are driving the world towards alignment, integration and convergence, which is being championed by global leaders and by the scientific community, nature-based solutions can support the CBD and UNFCCC to:

1. **Agree on a clear overarching mission.** The goals and missions of each UN Convention have technical language to consider the depth and complexity of the challenges to address. We propose to add a short and understandable meta-narrative that represents the three intertwined global crises – biodiversity loss, climate change and equitable development – and that also contributes to the 2030 Sustainable Development Goals: Living in harmony with Nature by securing an Equitable, Carbon Neutral and Nature Positive world.

2. **Align the mandates of all Conventions and other Multilateral Environmental Agreements.** Each MEA has a distinct role to play in driving specific outcomes, while also contributing to the outcomes defined by other Conventions and MEAs. Every single MEA must actively pursue the linkages with others and prioritise the implementation of nature-based solutions, to address multiple challenges.

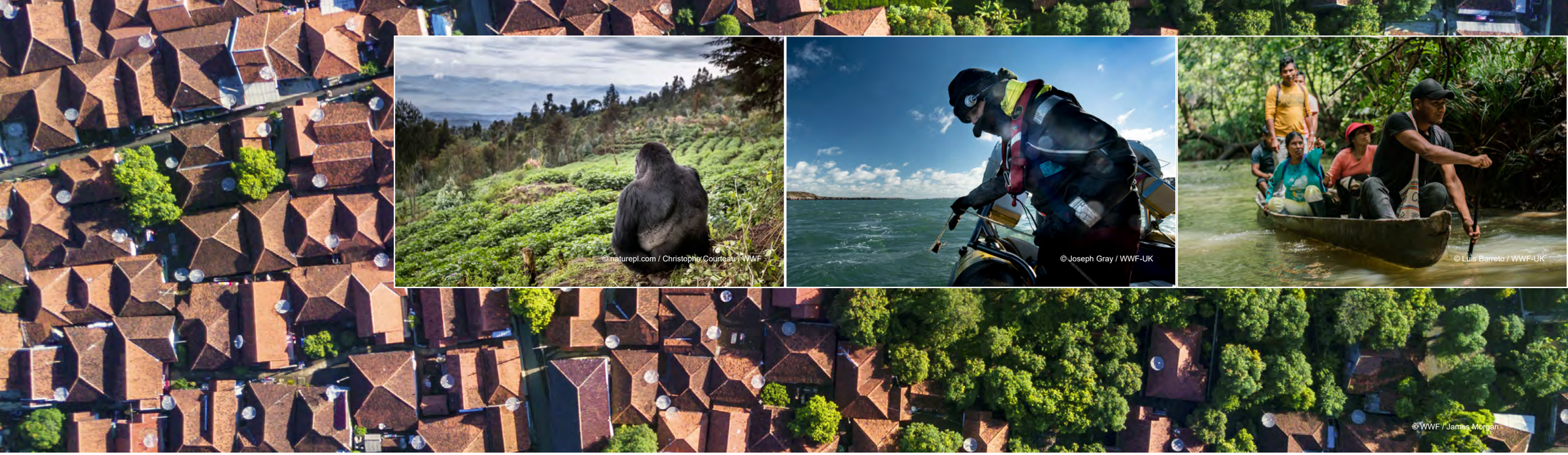
3. **Promote whole-of-government and whole-of-society approaches.** All government ministries and departments need to work together and unite behind ambitious missions, goals and targets that prioritise benefits across climate, development and nature; with the involvement and support of non-state actors and using tools such as nature-based solutions to improve integration and achieve impacts in a synergistic way.

174 G7. 2021. G7 2030 Nature Compact. Cornwall, UK.

175 Catarina, C. et al. 202. *Costs and Carbon Benefits of Mangrove Conservation and Restoration: A Global Analysis*. Ecological Economics, 176: 106758. https://doi.org/10.1016/j.ecolecon.2020.106758

176 Kuittinen, H. and Velte, D. 2018. *Mission-oriented R&I policies: In-depth case studies: Case Study Report: Energiewende*. European Union, Luxembourg. 54pp. doi: 10.2777/835267

177 For more information about the initiative please refer to: https://www.leaderspledgefornature.org.



4. **Measure and report progress within conventions.** The use of the right metrics supported by data is essential to ensure that goals and targets are being fulfilled. Nature-based solutions must be able to describe in a consistent and comparable way contributions to emission reductions, climate adaptation and human well-being – and how they advance the goals and targets defined through Global Biodiversity Framework of the CBD. Reporting metrics must also focus on outcomes and impacts.

5. **Synchronise reporting across conventions.** Current reporting mechanisms embedded in the implementation of MEAs fail to ensure that actions are taken when nations do not meet specific targets. For example, 10 years after the adoption of the Strategic Plan for Biodiversity 2011-2020, the international community has not met the Aichi Biodiversity Targets.[178] The Paris Agreement is addressing these implementation challenges through a ratcheting mechanism that gives Parties a chance to review their progress for each reporting period, and increase their national ambition if they identify a gap between global goals and national implementation. We recommend that the CBD adopts a "present, review, and ratchet" system to achieve the goals and targets of the post-2020 Global Biodiversity Framework.[179] Synchronised reporting will not only lead to greater alignment among Conventions but also stronger collaborations within and between governments.

Recommendations

To support the rapid scaling of nature-based solutions in a way that: unleashes their potential to accelerate the achievement of the Sustainable Development Goals; supports better alignment and convergence among the UNFCCC and CBD Conventions; and mainstreams the concept into national planning and implementation, we recommend:

TECHNICAL AND SCIENTIFIC

1. Continue working on sharpening and defining the (evolving) nature-based solutions concept, and piloting the nature-based solutions Global Standard, as a set of comprehensive field-based indicators to measure and report on the effectiveness of nature-based solutions in a standardised way.

2. Build upon IPCC and IPBES preliminary joint work and establish a permanent coordination work to: (1) continue designing transformation pathways and developing scientific evidence to give content to net zero and biodiversity positive objectives; (2) integrate climate and biodiversity towards the next key milestones – the 2023 Global Stocktake and, when defined, the first review/stocktake for the new Post 2020 Global Biodiversity Framework, respectively.

3. Better coordinate, from a scientific point of view, the actions and programmes on climate and biodiversity (including oceans) between the UNFCCC SBSTA and the CBD SBSTTA[180], guided by the IPCC and IPBES recommendations.

4. Create a joint UNFCCC SBSTA and SBI[181] agenda item on nature-based solutions to climate change, to optimise the role and importance of nature for climate change, mitigation, adaptation and loss and damage, and provide a recommendation by the 27th UNFCCC Conference of the Parties (COP27) in 2022 on how to include this formally in the climate regime.

POLICY AT THE GLOBAL AND NATIONAL LEVEL

1. The UNFCCC and the CBD must secure a formal recognition of the nature-based solutions concept in the UNFCCC COP26 Decision text in Glasgow, UK, and at the CBD's Global Biodiversity Framework to be agreed at COP15 in Kunming[182]; and establish/give a clear mandate to the Conventions to continue working on further developing and strengthening the nature-based solutions concept, for example by providing more detail on how nature-based solutions projects might be structured in Nationally Determined Contributions.

2. As more and more countries are raising their climate ambition to become net zero by 2050, it is imperative that governments reach those goals in a biodiversity positive way and that nature-based solutions fit to that purpose.

3. Government officials should clarify the role of nature-based solutions in net zero and nature-positive objectives.

4. Government decision-makers should embed nature-based solutions and land use in NDCs, national adaptation plans, long-term strategies, at regional and local level, including measurable targets for delivery; and with the engagement of non-state actors. Same in the UN CBD National Biodiversity Strategies and Action Plans (NBSAPs).

FINANCE

1. Funding for nature-based solutions must not come at the expense of other climate, development, and conservation priorities. New money needs to be allocated, rather than diverting money from, for example, renewable energy projects into nature-based solutions. Redirecting harmful subsidies from fossil fuels and unsustainable agriculture also offers a key avenue for doing so, particularly when public purses are stretched and the need for finance that creates multiplying public benefits is needed most.

WHOLE OF SOCIETY – NON-STATE ACTORS MOBILISATION

1. Expand the engagement of non-state and sub-national actors (north and south) for more coordinated advocacy and an ambitious response – at the national and international levels – to addressing intertwined challenges through nature based solutions.

2. Nature-based solutions must be a key sector/ key part of the UN CBD Sharm El Sheikh to Kunming Nature Action Agenda and play a linking role to strengthen collaboration among the Marrakesh Partnership Climate Action Agenda and their respective campaigns.

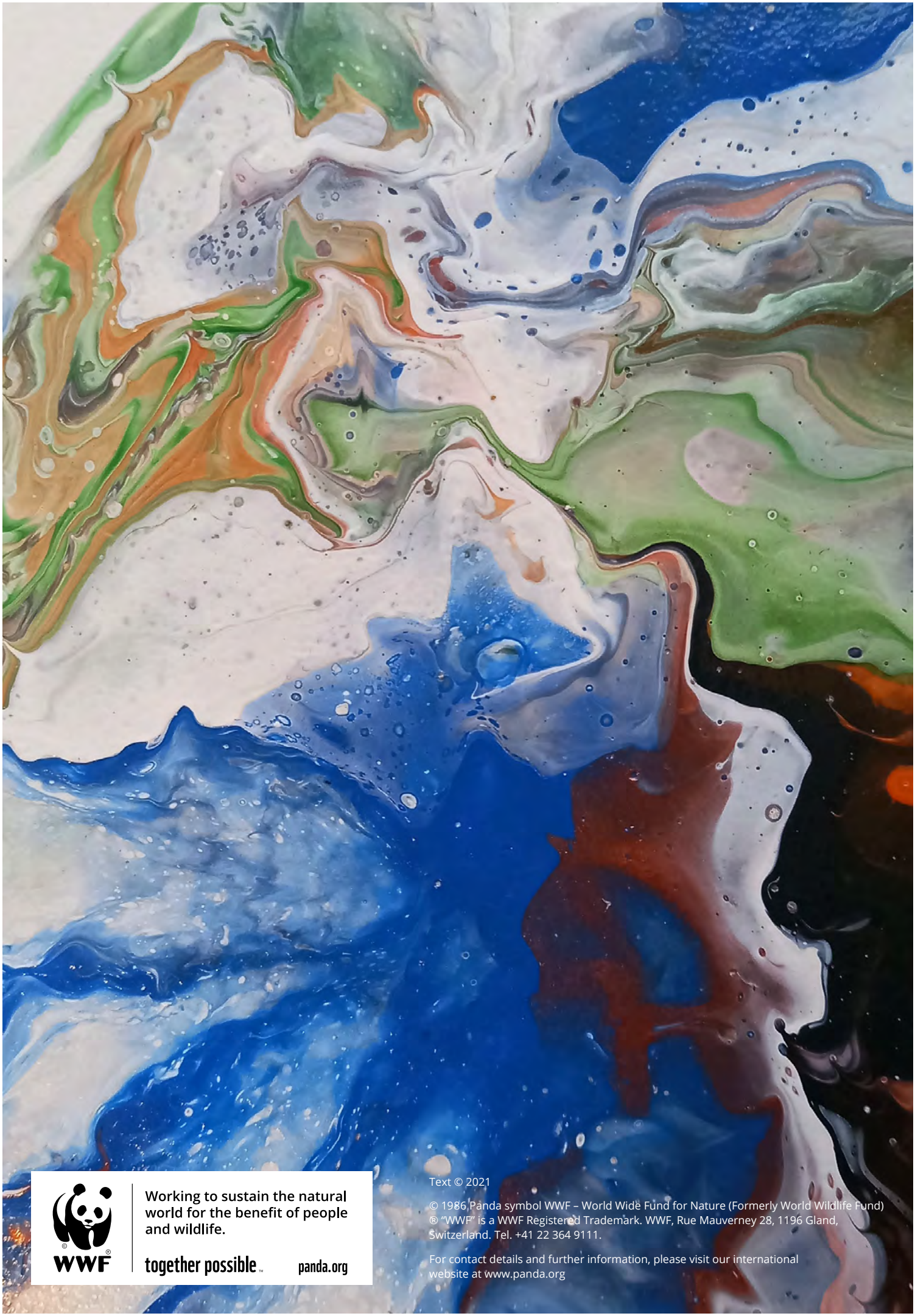
178 Secretariat of the Convention on Biological Diversity. 2020. Global Biodiversity Outlook 5. Montreal, Canada. 208pp.

179 World Wildlife Fund. 2019. WWF suggestion for the "transparent implementation, monitoring and reporting mechanism" with this link https://wwfint.awsassets.panda.org/downloads/wwf_briefing_on_implementation_mechanism_final.pdf

180 SBSTA is the UNFCCC's Subsidiary Body of Scientific and Technological Advice, and SBSTTA is the CBD's Subsidiary Body on Scientific, Technical and Technological Advice

181 The UNFCCC's Subsidiary Body for Implementation

182 World Wildlife Fund. 2021. *Nature Positive by 2030: Kunming Plan for Nature and People 2021-2030*. Discussion paper. 20pp.



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