

Nature-based Solutions in Action: Lessons from the Frontline

Harnessing nature to address the triple emergency of
poverty, climate change and biodiversity loss



In collaboration with:



Acknowledgements:

This paper has been produced by the above listed partners, with substantial contributions from members of the Climate Action Network UK (CAN-UK) Nature-Based Solutions Working Group (CAN-UK was formerly the Bond Development and Environment Group, DEG), and has been funded by IIED, WCS, RSPB, WWF-UK, Practical Action, Farm Africa and Tree Aid.

The case studies have been provided and written by the listed organisations.

This paper builds on the earlier Bond DEG paper '[Addressing the triple Emergency: Poverty, Climate Change, and Environmental Degradation](#)'.

Thanks go to the following people for their contributions to this report.

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How to cite:

Hou-Jones, X, Roe, D and Holland, E (2021) Nature-based Solutions in Action: Lessons from the Frontline. London. Bond.

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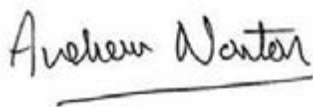
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Foreword

At the G7 Summit in June 2021, world leaders agreed an ambitious “Nature Compact” to address the interlinked challenges of biodiversity loss and climate change. The Compact recognises that climate change is one of the key drivers of biodiversity loss, but that at the same time, protecting, conserving and restoring biodiversity can make a significant contribution to tackling climate change and to helping local people adapt to its impacts. Biodiversity loss and climate change are two of three interlinked emergencies — the other being poverty alleviation and sustainable, equitable development — and the Compact highlights how tackling biodiversity loss and climate change can contribute to the achievement of the Sustainable Development Goals and a green, inclusive and resilient recovery from COVID-19.

Nature-based solutions (NbS) are one mechanism for addressing biodiversity loss, climate change and poverty in an integrated manner. The Dasgupta Review on the Economics of Biodiversity highlighted the need for much greater investment in nature in order to deliver sustainable development. NbS — interventions that protect, restore or sustainably manage nature — can provide a framework for that investment. However they have to be done well. They have to live up to their framing as interventions that tackle climate change and other societal challenges while also delivering benefits for biodiversity. Essentially, they have to be good for people — particularly those who are marginalised and Indigenous People and local communities. Too often, NbS are designed and implemented in ways that are bad for biodiversity (for example planting of a monoculture or exotic trees), bad for climate change (when they are used as a green-wash for business-as-usual fossil fuel extraction) and bad for people (when they result in land grabbing or when they undermine cultural links to nature).

Academic and policy literature abounds with the theory of NbS. This collection of stories documents NbS in action, on the ground. It presents the stories of people that have sought to implement NbS and of the environment and development organisations that have supported them. The fact that these stories have been contributed by both environment and development organisations is in itself testament to the common thread that NbS can provide between nature and development, climate and biodiversity. We hope it will provide inspiration for other practitioners as well as for those who drive climate, nature and development policy, particularly in this critical “super year” for nature, climate and people.



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Summary

The world is facing a triple emergency of climate change, nature loss, and rising poverty and inequality. These interdependent emergencies do not just represent three pressing challenges to humanity; they are interconnected in their causes and consequences, but therefore also in their solutions.

As the COVID-19 pandemic exacerbates what was already a 'triple emergency', we urgently need holistic approaches and solutions that work on these interdependencies. The world has a once-in-a-generation opportunity to fundamentally shift the course of human development to secure a lasting, prosperous, safe and just future for all.

2021 offers a potential turning point. This year, leaders will make crucial decisions across global processes, addressing climate change, biodiversity loss and sustainable development. We need to see greater ambition to act at this year's many major international meetings, including the 26th Conference of the Parties (COP26) to the United Nations Framework Convention on Climate Change (UNFCCC) in Glasgow, Scotland; the UN Food Systems Summit in Rome, Italy; the 15th Conference of the Parties to the Convention on Biological Diversity (COP15 of the CBD) planned for Kunming, China; the UN General Assembly, as well as other major meetings. The decisions made this year will shape the next decade of action for climate, nature and people.

Decision makers across government, business and communities are increasingly recognising that nature-based solutions (NbS) can contribute to addressing the crises. Defined 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"¹, high quality NbS involve working with, through, and for nature, people and climate. NbS offer a cost-effective approach that can deliver multiple benefits when done well.

NbS now regularly feature in international and national policies and plans, world leaders are increasingly making NbS commitments, and experts across many fields are highlighting the approach's credibility. Many have also raised concerns, particularly about the potential for NbS to be used by businesses or nations to replace or delay the deep decarbonisation of our economies that we know is urgently needed; that the approach could be seen as the commoditisation of nature; and that without adequate standards and safeguards activities done in the name of NbS could harm people and nature. So how do we use the positive commitments to NbS to drive action that works for people, nature and climate? This report is intended to present real-life evidence of how high quality NbS can deliver positive outcomes for climate, nature and people. It highlights common success factors to ensure that NbS are implemented well for the benefit of people, nature and climate.

The 13 case studies in this report have been contributed by environment, development and local community organisations. They show NbS in action in a wide range of contexts, from a Farmers' Seed Network in China that supports agroecology by conserving traditional seeds, to large-scale watershed management in glacial mountain ecosystems in Peru and managing flood risk in the UK.

The case studies reveal several 'success factors' that can put NbS on firm foundations. These include:

- Integrated approaches that conserve, restore and sustainably work with nature
- Landscape approaches that build on long-term multi-stakeholder partnerships
- Long-term engagements and planning that combine science with local and traditional knowledge
- Participatory approaches that ensure strong community ownership and engagement
- Combining short-term and long-term benefits, and securing them through sustainable finance strategies
- Developing policies that can remove barriers and drive systemic changes at large scales, and
- Action on gender equality and women's rights.

1 <https://www.iucn.org/theme/nature-based-solutions>

This report makes seven key policy recommendations for action in 2021:

1. Support local communities to champion NbS:

Indigenous Peoples and local communities (IPLCs) depend on healthy ecosystems for their livelihoods, and the natural environment often has deep cultural and spiritual significance for them. Nature is their first and often only defence system against changing circumstances, including disruptive climate change and extreme weather events. Local and traditional knowledge is indispensable and needs to be at the heart of NbS. All 13 case studies highlight the importance of supporting local communities for successful NbS. Governments should uphold IPLCs' rights, especially land tenure rights; prioritise funding for NbS that is locally led; provide the policies needed; and provide funding and support for community-based organisations that can ensure long-term community involvement.

2. Include strict safeguards and standards to avoid unintentional negative impacts or greenwashing: NbS should benefit climate, nature and people and should not be used to mask the true impacts of business-as-usual approaches. Clear safeguards should guarantee nature-positive outcomes, action on climate change, and involvement of IPLCs. NbS must uphold IPLCs' rights, be informed by IPLCs and be delivered by IPLCs wherever possible. NbS should also adhere to existing standards and guidelines, such as the four widely endorsed NbS Guidelines developed by the Nature-based Solutions Initiative² and IUCN's Global Standard for Nature-based Solutions.³

3. Shift to a systemic approach addressing the pressures of unsustainable production and consumption: Even scaled-up NbS will fail to have significant impacts unless unsustainable production and consumption are also addressed, especially in the food and agricultural sectors. For NbS to provide successful, sustainable responses to the nature, climate, and poverty and inequality crises, it is critical to eliminate systemic barriers (such as unsustainable supply chains, harmful agricultural subsidies and a lack of finance) and also to provide an enabling environment (through funding, markets and good governance).

4. Increase long-term funding for NbS, both in quantity and quality: The case studies clearly show that NbS,

if done right, can contribute to addressing the triple emergency. However, despite supportive political rhetoric, NbS receive only a small share of global climate finance.⁴ Furthermore, the world needs to invest US\$589–824 billion extra per year if we are to reverse the devastating decline in nature by 2030.⁵ We need increased public and private sector finance for NbS. The quality of funding is also key. Emerging commitments to scale up finance for NbS should put in place large-scale, long-term change and help finance the transition to sustainable, productive and resilient landscapes. We need to shift financial flows away from activities that destroy natural habitats and repurpose these harmful subsidies so that they instead support NbS.

5. Prioritise multi-purpose NbS at landscape scale and with a long-term vision: All the case studies show that NbS need landscape/seascape multi-purpose planning and management if they are to deliver large-scale and game-changing benefits for people, nature and climate. NbS that have a narrow purpose and focus only on one type of land use can do more harm than good. Funding for NbS should prioritise interventions at the landscape scale that deliver benefits for different communities and the marginalised people within those communities.

6. Facilitate multi-stakeholder partnerships to implement NbS: Different stakeholders need to be involved and to work together in the design and implementation of NbS, including local communities, government, private sector and other civil society actors. Governments can play an important role in facilitating and investing in cross-sectoral collaborations and enable interdisciplinary research that goes beyond siloed thinking and sectoral boundaries.

7. Integrate NbS as part of post-COVID-19 recovery: We need both governments and the private sector to invest more money in smarter ways so that nature can drive a green and fair economy and reduce pandemic risks. As highlighted in the Leaders' Pledge for Nature, NbS that work for people, nature and climate should be prioritised in governments' COVID-19 recovery plans and stimulus packages. Now is the opportunity to genuinely 'build back better' rather than reverting to business as usual.

This year, we need to drive high-quality NbS forward in international processes and strengthen the links between people, climate and nature in negotiations. This report is an important part of that journey — the case studies showcase NbS' real-life potential and how they are changing people's lives, protecting or restoring nature and driving climate action. This foundational evidence should help leaders embed high-quality NbS firmly in their decisions and plans this year and for many years to come.

² The four NbS principles (<https://nbsguidelines.info/>) were originally developed in February 2020 as a letter from 20 organisations to the President of the UN Framework Convention on Climate Change (UNFCCC) COP26, then adopted by the Together With Nature campaign in May 2020, and refined in February 2021. Additional signatories from research, conservation, and development organisations across the globe are now being invited.

³ The IUCN Global Standard for Nature-based Solutions lists criteria and indicators, as adopted by the Council's 98th meeting (in 2020).

⁴ unglobalcompact.org/take-action/events/climate-action-summit-2019/nature-based-solutions

⁵ <https://www.paulsoninstitute.org/key-initiatives/financing-nature-report/>

1. Introduction

1.1 Climate, nature, and poverty and inequality — three interlinked emergencies

The world is facing unprecedented and intertwined global emergencies — climate change, loss of nature, and rising poverty and inequality. Now the COVID-19 pandemic has added another layer of difficulty. These crises demand urgent, coordinated responses and actions so that future generations won't bear the unfair burden of solving the problems we have created today.

People: Though the global economy has doubled since the early 1990s, almost half of the world's population still lives on less than US\$5.5 per day, since most of the growth has benefitted only the wealthiest.⁶ Some 1.2 billion jobs in sectors such as farming, fisheries, forestry and tourism depend on healthy ecosystems.⁷ The COVID-19 pandemic has exacerbated the chasm between the rich and poor, pushed more than 250 million people to the brink of starvation and rendered the Sustainable Development Goal (SDG) of eradicating extreme poverty by 2030 a much more difficult task.⁸

Climate change: 2020 tied with 2016 as the earth's hottest year on record and saw more than 50 million people affected by a record number of floods, droughts, wildfires and storms.^{9,10} Without more ambitious policies and actions, the world will warm even further and is on a trajectory for almost 3°C of warming above pre-industrial levels by the end of the century.¹¹ Current levels of warming are already having devastating consequences for both nature and people, and warming of this magnitude will exceed communities' and ecosystems' abilities to adapt and will result in large-scale irreversible losses and damage.

Nature: All over the world, nature is declining at an accelerating and dangerous pace. We are losing habitats and species at unprecedented rates. People have significantly altered three quarters of the terrestrial land area and about two thirds of the marine environment. Degradation has cut the productivity of the global land surface by nearly a quarter and in 2015 at least a third of marine fish stocks were being harvested at unsustainable levels.¹² In the past few years, biodiversity loss has ranked high in the World Economic Forum's annual Global Risk

Reports. In its 2021 edition, biodiversity loss scored third (behind weapons of mass destruction and state collapse) as an existential threat.¹³ Furthermore, there is strong evidence that habitat loss and degradation — particularly deforestation and land conversion for industrialised agriculture — drive emergent zoonotic diseases such as COVID-19.¹⁴

Interlinkages between the three emergencies: These three pressing crises for humanity are interconnected in their causes and consequences (see figure 1) and solutions. People who live on less than US\$5.5 per day often rely very heavily on natural resources and have fewer opportunities and resources to adapt to climate change, which impacts them most while they are least responsible for causing it. Meanwhile, unsustainable agricultural practices globally and unequal social systems are resulting in low productivity and population pressures that are expanding agricultural frontiers and driving land-use change and ecosystem loss.

More than half of global GDP (around US\$44 trillion) is highly or moderately dependent on nature¹⁵ and 70% of the world's poor live in rural areas, depending directly on natural resources for their food, fuel, medicine, shelter and income.¹⁶ Climate change is contributing to biodiversity loss while also exacerbating poverty, undermining people's livelihoods, safety and ability to thrive and leading them to draw more heavily and unsustainably on nature, polluting and unsustainable practices, and debt — causing a vicious cycle. For example, drought-intensified wildfires devastate people's lives, livelihoods and sources of food, kill and displace wildlife and drive up greenhouse gas emissions. Rising temperatures lead to more carbon dioxide being dissolved into oceans, making seas more acidic, harming coastal ecosystems, and diminishing fish stocks upon which 116 million low-income country citizens depend for their livelihoods.¹⁷ People living in poverty often can't afford to buy replacements for previously free natural resources (such as food, fuel and fertilisers) and can't easily wait for natural services (such as the flood and landslide defences provided by healthy ecosystems) to recover or be replaced.

6 <https://www.ohchr.org/EN/HRBodies/HRC/RegularSessions/Session44/Pages/ListReports.aspx>

7 https://www.ilo.org/employment/units/emp-invest/rural-urban-job-creation/WCMS_757823/lang--en/index.htm

8 <https://www.ohchr.org/EN/NewsEvents/Pages/DisplayNews.aspx?NewsID=26043&LangID=E>

9 <https://www.nasa.gov/press-release/2020-tied-for-warmest-year-on-record-nasa-analysis-shows>

10 <https://www.cas2021.com/press/documents/reports/2021/01/22/state-and-trends-in-adaptation-report-2020>

11 <https://climateactiontracker.org/global/temperatures/>

12 <https://ipbes.net/ipbes-global-assessment-report-biodiversity-ecosystem-services>

13 http://www3.weforum.org/docs/WEF_The_Global_Risks_Report_2021.pdf

14 https://www.ipbes.net/sites/default/files/2020-12/IPBES%20Workshop%20on%20Biodiversity%20and%20Pandemics%20Report_0.pdf

15 http://www3.weforum.org/docs/WEF_New_Nature_Economy_Report_2020.pdf

16 <https://www.cbd.int/doc/publications/development/poverty-alleviation-booklet-en.pdf>

17 <http://www.fao.org/voluntary-guidelines-small-scale-fisheries/en/>

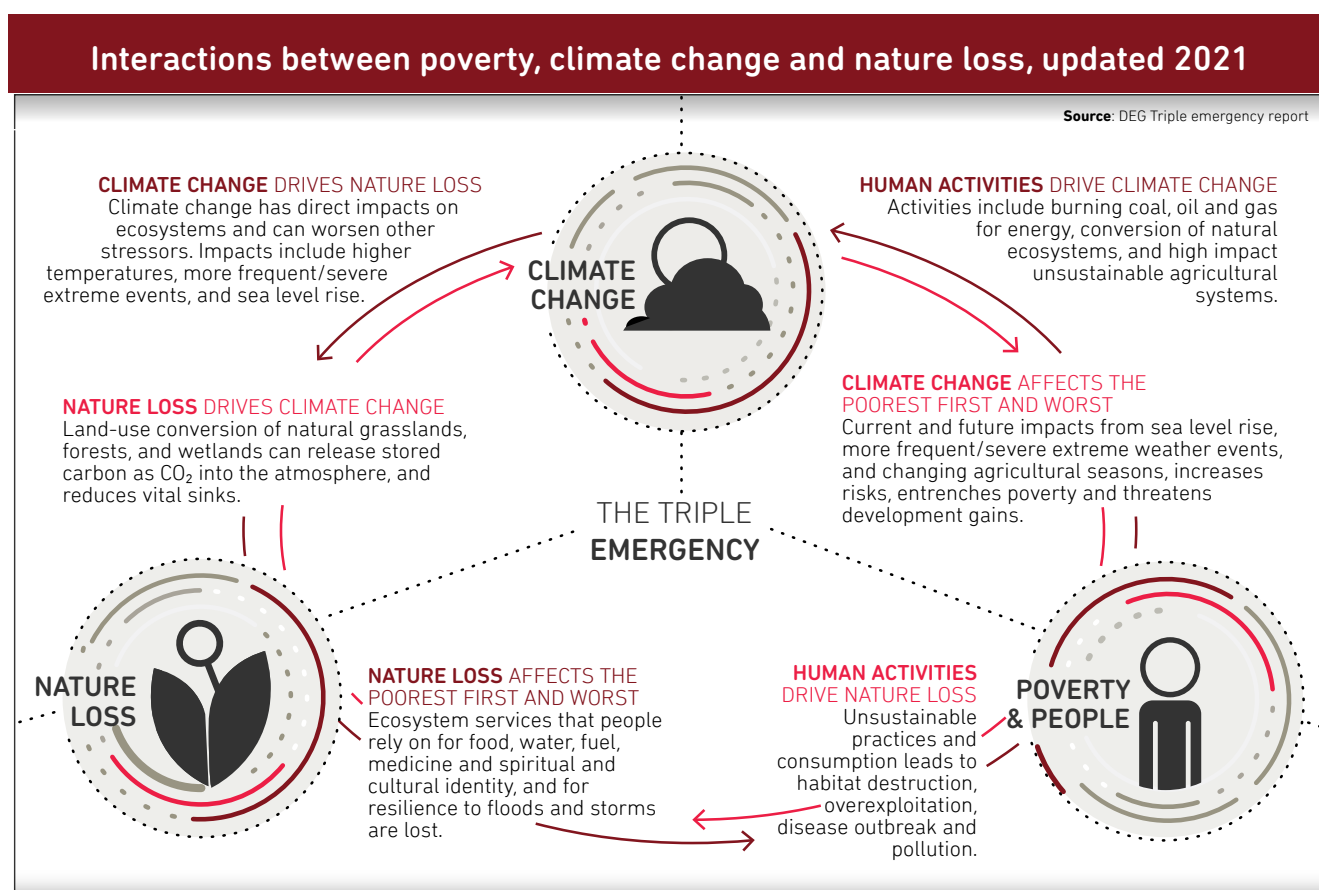
Just as climate change is contributing to biodiversity loss, so biodiversity loss and ecosystem degradation — including that of forest, grasslands, wetlands and marine ecosystems — contribute to climate change through the release of greenhouse gases. Land-use change accounts for a third of current global carbon emissions.¹⁸ Over-consumption in high-income countries is driving unsustainable land-use practices in low- and middle-income nations, in turn worsening both climate change and nature's decline, which further exacerbate poverty and inequality.¹⁹ For example, 100–300 million people are at increased risk of floods and hurricane damage because protective coastal habitats have been lost.²⁰

Conversely, healthy ecosystems can provide resources and services to help people to survive and thrive. They can help to mitigate climate change. Protecting our intact ecosystems, better managing our working lands, and restoring native ecosystems helps to avoid emissions

and enhance carbon sinks, with an estimated mitigation potential of around 10 gigatonnes of carbon dioxide equivalent per year. However, these actions need to be carried out alongside rapid decarbonisation of the economy if we are to limit global temperature rise to 1.5°C.²¹

Nature is also a crucial factor in enabling adaption to climate change and building resilience.²² For example, forests and other natural vegetation can stabilise slopes, prevent landslides, regulate water flow and prevent flash floods. Wetlands and floodplains can buffer floods and maintain water flow and quality in the face of changing rainfall patterns. Coastal mangrove and salt marshes can dissipate wave energy during powerful storms. Diverse agroforestry and farming systems can improve water retention and minimise impacts from drought and pest outbreaks.

FIGURE 1- INTERACTIONS BETWEEN POVERTY, CLIMATE CHANGE AND NATURE LOSS (SOURCE: DEG TRIPLE EMERGENCY REPORT, DIAGRAM UPDATED 2021)



18 <https://www.ipcc.ch/site/assets/uploads/2018/02/TAR-03.pdf>

19 <https://www.bond.org.uk/resources/addressing-the-triple-emergency-poverty-climate-change-and-environmental-degradation>

20 <https://ipbes.net/ipbes-global-assessment-report-biodiversity-ecosystem-services>

21 <https://www.nature.com/articles/d41586-021-01241-2#:~:text=Analysis%20suggests%20that%20to%20limit,and%20land%20for%20the%20future>

22 <https://pubs.iied.org/sites/default/files/pdfs/migrate/17636IIED.pdf>

1.2. Nature-based solutions: an integrated approach for interlinked emergencies

The interconnected climate, nature and poverty and inequality emergency require holistic solutions. NbS offer such an approach, involving “actions that protect,

sustainably manage and restore natural or modified ecosystems to address societal challenges”²³ (See Figure 2).

FIGURE 2: DEFINING NATURE-BASED SOLUTIONS (SOURCE: IUCN²⁴)



23 serval.unil.ch/resource/serval:BIB_93FD38C8836B.P001/REF

24 <https://doi.org/10.2305/IUCN.CH.2020.09.en>

By slowing, halting, or even reversing nature's decline, NbS can help people mitigate and adapt to climate change at relatively low costs, while delivering diverse economic,

social and environmental benefits for the world's poorest and most vulnerable.²⁵ Box 1 elaborates on some of these opportunities.

BOX 1: OPPORTUNITIES FOR POSITIVE IMPACT FROM NATURE-BASED SOLUTIONS

People: NbS offer an opportunity to create green jobs to reduce poverty. In addition, investing in natural habitat restoration can also deliver vital ecosystem services for people and businesses, which can support achieving the Sustainable Development Goals, especially in relation to poverty alleviation, food and water security, human health, and climate action. A review of hundreds of interventions to protect, manage, restore or harness nature highlights a wide range of local development outcomes for people in need of support.²⁶

Climate change: If paired with the immediate decarbonisation of the global economy, NbS could provide a reduction of global warming by around 0.3°C if warming peaks towards the end of the century.²⁷

NbS can grow natural carbon sinks, and reduce greenhouse gas emissions from agriculture, forestry and other land use. NbS can also reduce exposure and vulnerability to climate change impacts including extreme weather-related events. For example, creating and restoring tidal marshes or mangroves can protect coastal communities from storm surges. Similarly, increasing the trees and other plants in urban areas can reduce air pollution and assist with urban cooling.

Nature: The world's biodiversity is declining at an alarming rate. Existing conservation measures, while extremely valuable, are insufficient and under-supported. But understanding the wider climate-related and developmental benefits available through NbS could make a stronger case for investing in nature conservation and restoration.

NbS are becoming increasingly prominent in international biodiversity and climate change policy forums. Both the Global Assessment²⁸ of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) and the Climate Change and Land Report of the Intergovernmental Panel on Climate Change (IPCC)²⁹ highlight the important role of ecosystems in addressing the climate emergency. In addition, the recently published IPCC/IPBES Joint Working Group report underlines the importance of tackling the climate and biodiversity emergencies in tandem. It emphasises the importance of synergies in doing so, and avoiding trade-offs.³⁰ The Global Adaptation Commission and UN Climate Action Summit have specific 'action tracks' for NbS.^{31,32} More than two thirds of signatories to the UNFCCC's Paris Agreement include NbS in their climate change mitigation and/or adaptation strategies; and all low-income countries include NbS prominently in their Nationally Determined

Contributions.³³ Over 80 countries have endorsed a 'Leaders' Pledge for Nature', where they commit to reversing biodiversity loss by 2030, scaling up NbS and addressing the interlinked societal challenges.³⁴ The UK presidency of UNFCCC COP26 has presented nature as one of the priorities for the 2021 climate talks. And the 0.5 Draft of the Post-2020 Global Biodiversity Framework to be finalised and adopted under the Convention on Biological Diversity (CBD) at its COP15 highlights that NbS should be scaled up for climate change mitigation and adaptation.³⁵

While these political commitments are a good first step, we now need ambitious and integrated actions to transform how we treat and live with nature. NbS can provide a synergistic and integrated approach to addressing climate change and biodiversity loss, while supporting sustainable development. However, NbS also have risks and challenges (see Box 2) that must be factored into planning.

25 <https://pubs.iied.org/17651IIED>

26 <https://pubs.iied.org/20206iied>

27 <https://www.nature.com/articles/d41586-021-01241-2#:~:text=Analysis%20suggests%20that%20to%20limit,and%20land%20for%20the%20future.>

28 ipbes.net/global-assessment

29 ipcc.ch/srccl/

30 <https://www.ipbes.net/events/launch-ipbes-ipcc-co-sponsored-workshop-report-biodiversity-and-climate-change>

31 gca.org/global-commission-on-adaptation/action-tracks/natural-environment

32 un.org/en/climatechange/un-climate-summit-2019.shtml

33 portals.iucn.org/library/sites/library/files/documents/2019-030-En.pdf

34 <https://www.leaderspledgefornature.org/>

35 <https://pubs.iied.org/sites/default/files/pdfs/2021-05/20201iied.pdf>

BOX 2: CHALLENGES AND RISKS ASSOCIATED WITH NATURE-BASED SOLUTIONS

Careful planning is needed to ensure NbS can be implemented successfully, and deliver for climate, nature and people. Implemented poorly, NbS can unintentionally cause harm or maladaptation, and exacerbate poverty, inequality or insecurity. There is a high risk that they can be used as 'greenwash' for business as usual, or as a driver of land-grabbing from marginalised communities. Making sure NbS 'work' for climate, nature and people requires attention to potential risks and challenges:

NbS efforts should not distract from the need to immediately decarbonise economies and halt activities that are harming biodiversity.

Practitioners, investors and governments must guard against 'greenwashing', especially where investments in poor-quality NbS or NbS projects are used to offset or distract from business-as-usual emissions and practices. Failing to do this will eliminate climate benefits and could further damage livelihoods and biodiversity, as well as trust, and could harm future investment in such approaches.

Many NbS commitments and pledges have focused on tree planting. But this distracts from the urgent need to protect and restore existing habitats and ecosystems, and overlooks other key terrestrial, marine and coastal ecosystems.

Planting trees in the wrong places, such as existing high carbon stores like peatland, is also a significant risk and is counterproductive from a carbon sequestration perspective.

Benefits for adaptation, nature and people can be overlooked where NbS are presented as a tool primarily for climate change mitigation, leading at best to missed opportunities and co-benefits, and at worst to harm and maladaptation.

Some NbS have disadvantaged already-marginalised IPLCs, who have been excluded from decision-making processes, had their rights denied, and their lands appropriated.

Some projects implemented for climate-related purposes have led to perverse outcomes for biodiversity. For example, non-native trees are sometimes planted in biodiversity-rich ecosystems, or extensive monocultures are planted in place of natural vegetation.

NbS activities will only deliver long-term benefits for climate, biodiversity and people if the pressures of unsustainable production and consumption are addressed at the same time, especially in the food and agricultural sectors.

Multiple definitions and standards exist, sometimes making it difficult to determine which projects are NbS, and potentially complicating efforts to monitor and evaluate NbS activities.

The term 'nature-based solutions' doesn't resonate with all groups. For example, IPLCs are crucial and expert custodians of the natural world in biodiversity rich-and highly vulnerable locations around the world, yet some feel the term and practices do not adequately reflect the cultural aspects of their relationships with nature.

NbS projects need to include clear safeguards to guarantee positive outcomes for nature, people and climate, to uphold IPLCs' rights and leadership, to address systemic barriers that hinder NbS' deployment, and to ensure they are compatible with science and the goals of the Paris Agreement. NbS also need to be judged against rigorous definitions and standards in order to counter 'greenwashing'. The four widely endorsed NbS Guidelines developed by the Nature-based Solutions Initiative³⁶ and IUCN's Global Standard for Nature-based Solutions³⁷ offer good options.

In this report, 13 case studies from a range of contexts and countries (including the UK) provide strong evidence that, done well, NbS can help address the interlinked crises of climate change, nature loss, and poverty and inequality. The case studies also demonstrate how NbS could help

contribute to a green and just recovery from the COVID-19 pandemic. These rich 'on the ground' experiences reveal important common success factors and point to clear next steps.

In 2021, the world is poised to adopt a new Global Biodiversity Framework at the CBD COP 15 and set new climate ambitions at the UNFCCC COP 26. Decisions taken now will affect us all. The evidence and key messages reported here show how important it is for key international conventions to adopt coordinated responses and support integrated approaches. Now is the time to translate political ambition on NbS into transformative actions and to drive systemic change that goes beyond 'islands of success', delivering benefits for climate, nature and people.

³⁶ The four NbS principles were originally developed in February 2020 as a letter from 20 organisations to the President of the UN Framework Convention on Climate Change (UNFCCC) COP26, then adopted by the Together With Nature campaign in May 2020, and refined in February 2021. Additional signatories from research, conservation, and development organisations across the globe are now being invited.

³⁷ The IUCN Global Standard for Nature-based Solutions lists criteria and indicators, as adopted by the Council's 98th meeting (in 2020).

2. CASE STUDIES

Nature-based solutions to address the triple emergency:

Evidence and lessons from change-makers on the ground

Nature-based solutions case studies: locations



1. CHINA:

Community-based seed banks and agroecology practices

Implementing partners	NGO: Farmers' Seed Network, China Research institute: UNEP-IEMP (international Ecosystem Management Partnership) in Chinese Academy of Sciences
Location	Mountain regions in Yunnan and Guangxi Provinces in China
Ecosystem types	Mountain ecosystem including forests, agriculture land and freshwater (rivers, lakes and ponds)
Operational scale	18 villages managing 337 hectares of land
Time frame	2000 to present (evidence collated between 2000–2016)



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The Challenge

Climate change: Mountain regions in Yunnan and Guangxi Provinces have seen declines of total rainfall, changes in rainfall patterns, increased and prolonged drought (for example, droughts during 2010–2012 in Guangxi province and during 2010–2014 in Yunnan province), and more intense floods (for example, drought followed by floods in 2015); as well as pest outbreaks such as snout moth, and new pests and diseases due to climate change.

Deforestation and degradation of land due to unsustainable farming practices is increasing carbon emissions.

Nature: Agrobiodiversity is decreasing as industrial monoculture agriculture expands. For example, villages in

Yunnan provinces lost 50 local food crop varieties before the project began.³⁸ Traditional knowledge of farming and foods related to those crops has also disappeared. Natural habitat and biodiversity were also lost when hilly land and forests were burnt or ploughed up to plant monoculture crops and trees.

People: Poverty levels are among the highest in China in mountain communities that are highly dependent on natural resources for their livelihoods. Floods and droughts have decreased production and communities' income: for example, the 2015 floods reduced rice production by 50%.³⁹

NbS implemented

The solutions implemented focus on agroecology practices that increase biodiversity on farms, and community-based collective actions. Specific activities include:

Participatory plant breeding. Scientists worked with farmers to conserve traditional seeds, increase crop and seed diversity, and bring back indigenous crops and improve farmers' old varieties that are better adapted to climate change impacts such as drought and pests, based on traditional knowledge.

Traditional diversified farming practices to control pests and conserve water and soil. Reducing or eliminating the use of pesticides and harmful fertilisers by reintroducing

biopesticides using local wild herbs and chilli peppers; reviving intercropping; shifting farming; combining crop production with duck and fish cultivation to control pests and provide natural fertiliser; reintroducing trees on farms to help with soil conservation and adding additional income from non-timber forest products (NTFPs) such as nuts.

Interventions have also included reforestation and sustainable forest management on mountain slopes around the farms, centred around Indigenous Peoples' traditional practices of water and soil management which are based on their indigenous value system.

Achievements

Climate change: Climate change adaptation. The diversity of crops and seeds conserved provides options for adaptation and secures community access to seeds, and relying on their own seed system supports communities' recovery from extreme events.⁴⁰ More trees on mountain slopes for water and soil management aid adaptation to drought and reduce landslide risks in floods.⁴¹

Climate change mitigation: planting more trees on farms and mountain slopes, and agroecology practices improve soil carbon provide mitigation benefits, though not quantified.⁴²

Nature: Agrobiodiversity is improved, and more diversity of local crops and seeds is conserved: for example,

community seed banks in Yunnan conserve more than 200 varieties of seed.⁴³

Reduced pesticide and fertiliser use improves the soil microbiome and reduces harmful impacts to insects and animals.⁴⁴

Forest resource management has improved, and more bamboos and trees have been planted on community land and mountain slopes.⁴⁵

Agroecology practices have improved water resource management by reducing water use and water pollution.⁴⁶

People: The solutions have supported improved productivity, diversified livelihoods and increased income

38 Reid H. and Zhang Y., (2018) Ecosystem-based approaches to adaptation: strengthening the evidence and informing policy. Research results from the Participatory Plant Breeding and Community Supported Agriculture project, China. Project report. IIED, London. <https://pubs.iied.org/17624IIED/>

39 Reid H. and Zhang Y., (2018) Ecosystem-based approaches to adaptation: strengthening the evidence and informing policy. Research results from the Participatory Plant Breeding and Community Supported Agriculture project, China. Project report. IIED, London. [<https://pubs.iied.org/17624IIED/>]

40 Reilly, J. and K. Swiderska (2016). Biocultural Adaptation in Mountain Communities. Third INMIP International Learning Exchange, Stone Village, China. Event report. IIED, London. [<https://pubs.iied.org/14669iied/>]

41 Reid H. Zhang Y., 2018 (n39)

42 Reid H. Zhang Y., 2018 (n39)

43 Reilly and Swiderska 2016, Xin Song etc. 2021

44 Reid H. Zhang Y., 2018 (n39)

45 Reid H. Zhang Y., 2018 (n39)

46 Reid H. Zhang Y., 2018 (n39)

for farmers: new maize varieties developed through participatory plant breeding processes have a 15–30% higher yield than landraces and are more tolerant to drought and more resistant to pests. Overall, staple food crops have seen productivity increase by 15–20% and incomes have tripled. Farmers are also using more intercropping and growing trees on farms which allows them to not only have incomes from crops but also from fish, ducks and nuts from trees⁴⁷.

Success factors

Establishing direct market links for diversified farm products helped to ensure farmers can financially benefit from NbS by giving them secure and stable access to high-value niche markets, for example, farmers' markets, environment-friendly consumer groups, or direct purchase/contracts from restaurants in cities.

Traditional knowledge supported by modern science: traditional knowledge of plant diversity, ecological farming and collective water management was crucially important for the fast uptake and spread of those nature-based activities in communities. Working together with scientists, communities can improve their old varieties and even breed new varieties that can help them adapt to climate change based on traditional knowledge. They also gain more understanding of how traditional practices and

Significantly higher food self-sufficiency: compared to other villages in the same province, those implementing agroecology activities are relying significantly more on local and indigenous food resources, and are more self-sufficient in food provision (this is extremely important for those mountain communities that are far from markets and lack secure access to extension services)⁴⁸.

agroecology are better for their communities in the long term, providing better income, access to natural resources and helping them to adapt to climate change in the long term.

Strengthening community-based organisations to foster collective actions: women leaders were supported to establish informal groups to support each other in conservation farming and to strengthen communities and bonds within and among groups. Those groups expanded into five registered farmers' cooperatives that help enhance access to market and finance and continued exchanging lessons on how to implement NbS for climate change. Revived traditional knowledge and customary law also helps cultivate and nurture collective responsibility to care for common goods.

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Blog: [Working with nature to build back better from COVID-19: inspirations from farmers in China](#)

Photo gallery: [EbA and COVID-19](#)

Video: [Interview with farmers in Yunnan](#)

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⁴⁷ Song et al. 2016

⁴⁸ Song et al. 2015

2. ETHIOPIA:

Farmer-managed forest landscape restoration

Implementing partners	NGO: World Vision Ethiopia Government: Government of Ethiopia Community-based organisations: seven village cooperatives Other: World Bank
Location	Humbo, Ethiopia
Ecosystem types	Mountain ecosystems with forests and agriculture land
Operational scale	2,728 hectares
Time frame	2005–2014



© World Vision. Left: Before image, 2000. Right: After image, 2007

The Challenge

Climate change: Humbo's mountainous terrain was highly degraded, rugged and chronically drought-prone. High levels of deforestation were threatening groundwater reserves that were the main source of drinking water for 65,000 local residents. Soil erosion coupled with heavy rainfall and cyclones regularly led to flooding and mudslides in the highlands. These killed people and livestock, and damaged crops, roads, bridges and other infrastructure. Prolonged drought conditions have also been exacerbated in the lowlands. In a country where 90% of the population depends on agriculture for their livelihood, recurrent drought and flood events create poverty traps for many households, constantly thwarting

efforts to build up assets and invest in a better future for themselves and their families.

Nature: The forests surrounding Humbo had largely been destroyed by the late 1960s. Deforestation was mainly caused by poverty, hunger and increasing demand for agricultural land. By the time of this project, less than 4% of native forests in Ethiopia remained and wildlife had decreased significantly due to habitat loss.

People: Prior to the start of the project, there were 48,893 people living in the Humbo area. According to a World Vision survey, 85% were living in poverty, where the average per capita annual income was less than US\$100.

NbS implemented

World Vision Ethiopia trained farmers to practice farmer-managed natural regeneration (FMNR), a low-cost, innovative technique used to restore and regenerate trees from the stumps of previously cut-down but still living trees. Farmers are trained in the pruning and coppicing techniques that can stimulate faster regrowth. They are encouraged to select a variety of trees to regenerate, including native species, fruit trees, and other varieties that help to fix nitrogen in the soil or produce fuelwood or fodder. Farmers then can use pruned materials as firewood and fodder.

The project organised farmers to practice FMNR on communally owned hillsides that were heavily degraded

due to overgrazing and overcutting. World Vision facilitated local communities and authorities to sign agreements to close off degraded communal hillside areas and only permit FMNR practices to enable the forests to be restored. Compared to planting seedlings, the forests were regenerated much more quickly and at lower cost through FMNR, thanks to the large existing root systems. The regenerated forests have helped to recharge ground water, including springs, and reduce flash flooding, land degradation and soil erosion.

World Vision Ethiopia also supported farmers to establish nurseries and plant both native species and commercially viable tree species to supplement their income.

Achievements

Climate change: The Humbo project became World Vision's first Clean Development Mechanism project, and the first of its kind in Africa to be registered by the World Bank.

By June 2009, 2,728 hectares of degraded forest had been protected and were being restored and sustainably managed. Over the 30-year period for capturing carbon credits, it is estimated that over 870,000 tonnes of carbon dioxide equivalent will be removed from the atmosphere, making a significant contribution to mitigating climate change.

By 2018, the project had sequestered 165,000 tonnes of CO₂, generating more than US\$ 500,000 as carbon offsets for the community, through the World Bank's BioCarbon Fund. The project has now ended but the community are still generating and selling carbon credits and will continue to do so. The carbon revenue has improved livelihoods by supporting the local community to build eight flour mills and nine grain stores, purchase 240 solar panels and give access to micro-credit services to over 1,200 households for investment in different businesses.

Reforestation is also reducing land degradation and soil erosion. Water infiltration is improving, resulting in the recharging of ground water and reduced flash flooding. Community members have noted that, due to increased

leaf litter fall and the return of grass to the hillsides, there is significantly less flooding, erosion and siltation of their farmlands located downstream from the project area. With the likelihood that climate change may cause increased rainfall in Ethiopia's highlands, soil stability is essential for reducing vulnerability to flash flooding and stabilising soil for agricultural production.

Nature: In the first 36 months after project activities commenced, the change in vegetative cover was so pronounced as to draw the attention of all levels of government, universities, other development partners and communities visiting the project site. Community members have observed an increased presence of wildlife and birds in the forest and have sighted native wildlife that had previously left the area including antelopes and wild goats.

Native vegetation has increased: by June 2009, 2,728ha of degraded forest have been protected, restored and sustainably managed. Tree regrowth had reached 2–5m, from stumps at ground level, since project inception. Within the 2,728ha, more than 700ha of the area under management had been pruned using FMNR techniques. In addition, some 230ha unsuitable for FMNR had been replanted with indigenous and commercial species with a survival rate of 79%.

Residents of the communities have observed that fruit from five indigenous tree species are becoming increasingly available as the trees grow.

People: The regeneration of the Humbo forest produced tangible benefits for the well-being of local communities. In a preliminary study in July 2008 (three years after the project began), a common sentiment expressed by community members was: “We never expected to see so much grass growing from these rocky, barren slopes, to see trees growing so quickly or to harvest firewood so early in the programme”.

Increased production of non-timber forest products, including honey, medicine, fibres, fruit and wildlife, is

contributing to household economies. Improved land management has stimulated grass growth, providing fodder for livestock and a resource that can be cut and sold as an additional source of income. At one site, Bola, 300 bundles of grass were harvested and sold during the first year of the project.

Crops near reforested areas also benefit through modification of the microclimate, which comes about through a combination of reduced wind speed, lower temperatures, higher humidity and greater infiltration of water into the soil. The resulting healthier crops and livestock are essential to community members’ good nutritional status, health and livelihoods.

Success factors

A foundation of community trust: this project built on 18 years of prior development work undertaken by World Vision in the Humbo District. The trust established between World Vision and the community delivered a platform for presenting the concept of a carbon and forestry project and gave the community confidence.

Realising early success: community support for the project improved as the project progressed. Even so, it was not until actual physical benefits were realised that most community members fully believed that they were the primary beneficiaries, and that the degree of their participation would affect how much they benefitted. As communities began harvesting and utilising fodder and firewood according to their management plan, even those who had been ambivalent became more actively involved in the project.

Collaboration and teamwork: from the outset, the Humbo project focused on collaboration among community, local, state and national authorities. Focus groups were engaged through participatory rural

appraisals in each community, to assess interest and willingness to make the necessary changes to land use that would be required to adopt FMNR. The NGO’s office in Ethiopia and the support office in Australia formed a strong partnership and worked closely with specialists from the BioCarbon Fund of the World Bank and the consultancy Joanneum Research.

Institutional support from inception: letters of support for the project from Woreda state and regional governments were secured. A letter of no objection and letter of approval were subsequently granted from the Ethiopian Environmental Protection Authority (EPA), the Designated National Authority. The BioCarbon fund team at the World Bank was effective in supporting this process, and in realising additional start-up funding for capacity building and technical support.

Compliance: a clear awareness of the requirements of the Clean Development Mechanism (CDM) process from the beginning of the project was essential to ensure collection of relevant data and appropriate actions.

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Video: **Trees of Life: Humbo Reforestation project**

Contact

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3. GHANA:

Farmer-managed and community-based dryland restoration

Implementing partner	NGO: World Vision Ghana
Location	Talensi, Ghana
Ecosystem types	Dryland ecosystem with forests, agriculture, savanna, shrubland and grassland
Operational scale	50,000 hectares
Time frame	2009–2020 (evidence collated for 2009–2017)



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The Challenge

Climate change: Talensi lies in an environmentally fragile dryland area of Eastern Ghana. In recent decades, its population, mainly subsistence rain-fed farmers or pastoralist families, has seen annual rainfall decline due to climate change, forest cover loss, and associated biodiversity disappearance and loss of productivity from increasingly infertile soil.

Erratic rainfall patterns have reduced the predictability of the rainy season, with extended dry spells and intensified downpours. These climatic changes make it difficult for farmers to know when to plant, causing significant crop losses.

Nature: World Vision Ghana's pre-project assessment and the baseline survey in 2010 found that unsustainable farming methods and over-exploitation of forests for fuel and construction materials caused loss of soil fertility, declining yields and decreased tree cover and associated biodiversity/natural resources.

Dry season bushfires and field burning were preventing natural and assisted restoration and recovery of tree growth, grass and other natural habitats. The destructive fires discouraged the planting of productive trees.

People: Talensi is in the Upper East Region of Ghana, a rural location with the third highest poverty rate in the country. Despite the availability of arable land, there are a number of complex factors that prevent farmers from moving out of poverty. Ghana's Ministry of Food and Agriculture has reported consistently (in 2007, 2015 and 2018) that the land is facing increasing degradation from climate change and deforestation, poor farming practices, overgrazing, felling of trees for wood and charcoal, and bush fires to clear land for farming. This has left fragile soils exposed to erosion and poor water retention which has led to poor crop yields and food insecurity, with farmers becoming poorer.

NbS implemented

To reverse deteriorating soil fertility and natural resources, the project mobilised communities to use Farmer Managed Natural Regeneration (FMNR) to restore multi-purpose trees to rural landscapes. FMNR is a low-cost, innovative technique to restore and regenerate trees from the stumps of previously cut-down (but still living) trees. In Talensi, farmers are trained to use FMNR to regenerate trees on farmers' crop and pastoral fields; as well as in community managed FMNR forests, where tree densities were much higher than in crop fields. As farmers prune trees to stimulate natural regeneration, more leaves and branches from the pruning process are left on site, and they improve soil quality and reduce soil erosion.

The project also trained farmers to adopt sustainable agriculture techniques such as bulk composting, field mulching and ox ploughing. It supported communities to adopt diversified income-generating activities including planting fruit trees, honey production and the establishment of community savings groups.

The project facilitated the formation of community volunteer fire brigades to manage bushfires, reduce field burning and enhance natural regeneration. The project also facilitated community agreements and the establishment of community by-laws to limit tree cutting and reduce field burning.

Achievements

World Vision's FMNR project in Talensi began in 2009, and an evaluation was conducted in 2018, covering implementation up to 2017.

Climate change: The evaluation showed that there was very high uptake of FMNR among farmers in Talensi, with 96% of survey respondents reporting that they practised FMNR on their farms. The survey showed that the number of farmers implementing tree management practices and protecting trees from bush fires had also increased. Eighty percent of farmers reported an increase in the number of trees in the community, and only 12.5% were still burning their fields. The new practices all contribute to a reducing carbon emission from unsustainable land use.

Use of improved soil management practices increased, with 94% of farmers managing the quality of their soil, and 64% reporting an increase in soil fertility. Soil erosion was reported to have declined over the course of the project, with 57% of farmers at the evaluation noting a decline and 82% reporting no degraded land.

Restored soil and trees on farms help increase water retention and reduce soil erosion in heavy downpours, reducing farmers' vulnerability to irregular rainfall patterns due to climate change.

Nature: As a result of the project, the communities had restored 718 hectares of degraded land using FMNR and these were protected by the enforcement of community by-laws.

The managed forests now contain around 568,580 trees. Of these, some 377,000 indigenous trees can be counted as additional due to the project, with an average density of 2,343 trees per hectare (compared to a baseline of around 10 trees per hectare).

Aside from natural tree regeneration, the project also directly contributed to the planting of 23,000 additional fruit trees in the project area.

People: The percentage of households reporting one or more hungry months during the year reduced from 87% at

the project baseline to 63% at the time of the evaluation in 2017. There were no households reporting 'severe hunger' at the evaluation, compared to 6% at the baseline.

The proportion of households reporting a diversity of income sources increased from 56% at baseline to 95% at the evaluation. While not necessarily increasing actual income, having a more diverse source of income is likely to lead to increased resilience. The increase in soil fertility and tree cover may have contributed to this increase in income diversity by enabling a greater range of food crops to be grown, and also by increasing the availability of fruit from fruit trees regenerated by FMNR.

The project also established savings groups, and we saw the proportion of households belonging to a group increasing from 8% to 76% over the course of the project.

This contributed to the proportion of households having access to at least one source of credit increasing from 21% to 58%.

FMNR activities have built strong community resilience. Restoring degraded land and increasing tree cover helped reduce the impact of droughts, with trees serving as windbreaks to protect crops and topsoil. Incidences of bushfires and soil erosion have also decreased, contributing to an overall decline in the number and severity of shocks that project participants experienced. For instance, the percentage of households experiencing crop failure reduced from 49.8% to 38.4%, while the percentage of households experiencing loss of main income reduced from 7.1% to 2.5%.

Success factors

Combining short-term and long-term benefits: The FMNR activities in Talensi were integrated with other initiatives that helped to alleviate the poverty in the area. This enabled communities to see the impact of the whole project engage with the FMNR activities alongside the other project activities.

The strength of FMNR as an approach is that it links strongly with agriculture, food security and livelihoods, through the impact it has on soil quality, water absorption and agricultural production. The technique is extremely low cost and simple to apply, making it easy for farmers and communities to adopt. An added advantage is that it involves the pruning and coppicing of new growth rather than requiring a regime of no cutting, which is sometimes imposed on communities to reduce deforestation.

Communities have seen the benefits of sustainable and resilient approaches to agriculture and as a result have developed their own community sustainability plans. This forward planning is likely to lift environmental and economic benefits further after the project ends. In all 25 communities, by-laws have been developed and are now at various stages of implementation.

Fostering collective responsibilities and action:

The FMNR approach has strengthened community bonds and cohesion across the different groups and families participating in agricultural value chains. The two main ethnic groups in Talensi work together collaboratively on land management, while the inclusion and valued participation of women and youth in agriculture and associated industries has been noted broadly in focus groups and interviews.

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4. KENYA:

Community-based mangrove forest restoration

Implementing partners	NGO: Plan International Kenya Government: Kenya Marine and Fisheries Research Institute; Kenya Forest Service Community-based organisations: Beach Management Units Other: Plan International UK
Location	Kwale County, Kenya
Ecosystem types	Coastal ecosystems with mangroves, forests and agricultural lands
Operational scale	Four communities covering approximately 17 hectares
Time frame	2017–2020



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The Challenge

Climate change: The southern coastal region of Kwale County has seen changes in rainfall patterns, including declining average seasonal rainfall and increasing intensity and frequency of heavy rains, which increases soil erosion inland. Storm surges occur more frequently and are stronger, and heatwaves are more frequent and last longer. These climatic changes have led to increased food and water insecurity.

Nature: Mangrove forests in Kwale have been subject to alarming levels of destruction over recent decades, mainly due to demand from charcoal production and timber use. Mangrove loss reduces coastal protection from extreme weather and shrinks the breeding habitats for a diverse array of marine species. According to the National Mangrove Ecosystem Management Plan (Government of Kenya, 2017) the mangroves of Kwale County comprise the Vanga-Funzi, Gazi Bay, and Ukunda areas covering an area of approximately 8,354 hectares, with 45% of this area consisting of mangroves requiring rehabilitation.

Overfishing, illegal fishing (using dragnets and poisoning) and destruction of coral reefs (caused by pollution from

unregulated and inadequate sewage systems) also have a deleterious effect on the local coastal ecology.

Since 2000, Kwale County has also witnessed the loss of 20% of its tree cover.⁴⁹ Local communities fell trees for myriad reasons: agricultural expansion, living space for rapidly growing populations, charcoal production, because of weak governance, overreliance on wood energy and, to a lesser extent, for mining.⁵⁰ Deforestation contributes to soil erosion, soil degradation, water resource loss and leaves vulnerable populations more exposed to climatic events.

People: Before the project started, the most recent data showed Kwale County had an estimated population of 783,261, of which 74.9% lived in poverty. The coastal community is highly reliant on natural resources (agriculture and fishing) which are adversely affected by climate change and environmental degradation. Coastal communities reported a declining trend in fish productivity and diversity, and low levels of income diversification among coastal households. This increased their vulnerability to climate-related events, household-specific shocks such as injury and illness, and economic stresses.

NbS implemented

Mangrove forest restoration: four community-based groups (comprised of equal numbers of men and women) have been growing and replanting mangrove seedlings along the Kwale coastline — growing a total of 243,000 seedlings to date.

Seaweed farming: three community-based groups engaged in seaweed farming, providing an alternative livelihood to fishing, agriculture or charcoal production — activities that put pressure on already-stressed natural

resources. Seaweed farming is non-invasive, non-polluting and, if done correctly, is an environmentally sustainable livelihood activity. Seaweed farming is also low investment and low risk and a preferred income-generating activity among women.

Tree replanting: two community-based groups and two schools have planted a total of 15,360 seedlings in various sites across the four communities.

Achievements

Climate change: the project has supported alternative and supplemental livelihood strategies that can enhance the ability of local communities to withstand climate and economic risks. Mangrove forest restoration and seaweed farming have been protecting the coastlines from coastal flooding, storm surges and coastal erosion. Inland, in the upstream communities, tree replanting is contributing to reducing the risk of soil erosion.

Nature: Led by community mangrove groups and tree planting groups in upstream communities, the project's planting activities have returned increasing yields in terms of numbers of trees grown and their survival rate. Over the two-year period, 127 people across four groups, (of which 50% were women), planted 137,000 mangrove seedlings. A further 56,000 seedlings have been planted since the

project formally closed. Additionally, 820 people (women, girls, boys and men — again with 50% female participation) have planted 7,940 seedlings for regrowth of fruit trees, native forest species and charcoal replacement trees. Although there has been some attrition rate with seedlings being lost at the beginning due to poor management, the survival rate has been, on average, 80%.

People: Based on local households' preferences,⁵¹ the project diversified and enhanced existing livelihood options for community households, particularly focusing on seaweed farming.

At the end of the project, the number of functioning seaweed farms had reached 91, spread across three community groups and producing 10.73–20.3 tonnes per

49 <https://rainforests.mongabay.com/deforestation/archive/Kenya.htm>

50 Ministry of Forestry and Wildlife (2013) Analysis of drivers and underlying causes of forest cover change in the various forest types of Kenya, Nairobi, Kenya <http://www.kenyaforests-service.org/documents/redd/Analysis%20of%20Drivers%20of%20Deforestation%20&forest%20Degradation%20in%20Kenya.pdf>

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year. Initially, mainly women were engaging in seaweed farming. However, by the end of the project, as the interest in the business opportunity grew, 236 men were recorded as working on seaweed production, as well as 243 women. The seaweed crop cycle is approximately 45 days long and farms are able to complete up to seven cycles per year. Each farm produces on average 0.6 tonnes per cycle. The cost of production per farm is between KSh1,200–7,000 per year. The farmers spend on average KSh1,133 per farm per cycle.

All groups sell their produce at KSh25 per kilogram. It is observed that seaweed farming is turning out to be highly

profitable for the groups, farms and individuals engaged in it. The average net profit from seaweed farming has been reported as KSh 13,866.66 per farm. The net profit per cycle is, on average, KSh 2,000.

At the end of the project, women reported that they were able to invest their earnings into paying for their children's school fees, health-related expenses and improving their quality of life (for example, safe water access, house improvements). The end-of-project survey also revealed improvements in children's welfare.

Success factors

Strong community engagement was vital. The emphasis given to the role of the local communities in catalysing social, economic and ecological transformation has been central to the project, as it aims to promote a sense of ownership of the local natural capital and transparency in its management while valuing and strengthening existing traditional knowledge and local people's ability to identify solutions.

Participatory approaches have enhanced the sense of ownership of project activities and contributed towards a strong foundation for sustainability.

Gender inclusion has contributed to resilience. When women have agency in sustainably managing natural resources and have better control over household income, it results in concrete benefit to the natural environment, community well-being and the local economy. Women are more likely to use improved earnings to invest in the

long-term well-being of the wider household and community (for example, children's education and health-related expenses), thereby contributing to strengthening household and community resilience. As primary caretakers of their household, women play a critical role in the sustainable management of the local environment and biodiversity. These investments improve household ability to withstand the risks arising from climate change and shifts to different livelihoods.

Local government co-operation is particularly important to ensure that continued technical support and innovation is promoted to local groups, and to ensure that approaches and evidence are informing policy, regulatory and legal changes. In this regard the support of the county government, KMFRI, Kenya Forestry Services, NEMA and Beach Management Units were integral to contributing to the successes of the project.

Resources

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Video: **Conservation and sustainable use of Marine Ecosystems in Kenya**

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5. MALI:

Community-based dryland restoration

Implementing partner	NGO: Tree Aid
Location	Segou Region, Mali
Ecosystem types	Dryland ecosystems with forest, savannah and agriculture land
Operational scale	20,404 hectares
Timeframe	July 2017–June 2020



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Context

Climate change: The region is particularly vulnerable to climate change due to its location south of the Sahara Desert and the strong dependency of the population on rain-fed agriculture. Increasing temperatures, changes in rainfall patterns, as well as more frequent and extreme climate events (floods and droughts), result in loss of assets and crops as well as food price shocks that worsen an already difficult situation of high poverty levels and food insecurity. For example, temperatures across the Sahel have increased by nearly one degree Celsius since 1970, nearly twice the global average.⁵² This has increased the risk of forest and bushfires which release more carbon into the atmosphere.

Nature: Regional ecosystems are degraded due to prolonged drought, agricultural expansion, forest degradation and deforestation, erosion and biodiversity loss from poaching. As a result of long-term declines in rainfall from the 1970s–1990s, the Sahel ecological zone

has shifted 25–35km southwards, resulting in biodiversity loss and conversion of arable land to sand dunes. Habitat and biodiversity losses disrupt food chains, multiplying negative impacts. The project area, the Duwa and Sutebwo forests, are an example of this severe degradation: between 2000–2015, an estimated 3,300 hectares of dense tree cover have been lost across the two forests. This has been replaced by open savannah woodland, most of it now degraded, and agricultural land.

People: The project worked with 2,672 rural households affected by poverty and food insecurity. At the start of the intervention, 86% of the project population were living below the poverty line⁵³ and 20% were below the calorie line.^{54,55} Project participants included 30% of women, who are significantly more affected by poverty and environmental degradation than men because of their limited opportunities to access and control productive resources and markets.

Nature-based solutions implemented

The project aimed to protect and restore the biodiversity of the Duwa and Sutebwo forests (20,404 hectares in total) while increasing household incomes and contributing to poverty reduction in 41 local communities in the district of Tomini.

The project supported tree planting and care, farmer-managed natural regeneration (FMNR) and agroforestry. FMNR involves farmers to regularly prune a tree to stimulate growth. After pruning, cut leaves are left on farm to reduce erosion and return nutrients to soil and pruned stems can be used as firewood, reducing pressure on forests.

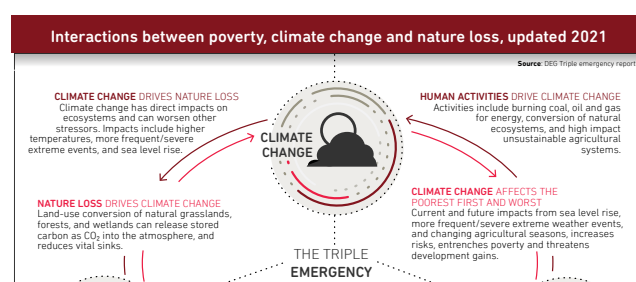
These solutions restored and sustainably managed forests, which also provide a variety of NTFPs such as fruits, nuts, oils, butters, traditional medicines and nutritious foods for local communities. Products from shea trees, baobab and African locust beans as well as honey production help diversify community incomes and improve the autonomy of women who otherwise have limited cash-generating opportunities.

The intervention also helped to establish firebreaks around restored areas to prevent the destruction of existing forests and new trees.

Achievements

Climate change: Climate change mitigation. Promotion of trees on farmland and improved tree cover in wooded savannah has increased above-ground carbon storage, providing mitigation benefits. Though overall improved carbon storage capacity is not quantified, data shows that in fallow agricultural land and open savannah woodland, there has been a marked improvement in the tree density, increasing from an average of 168 trees/ha to an average of 182 trees/ha.

Climate change adaptation. The project supported climate change adaptation by promoting more inclusive and participatory local structures for managing natural resources. Seventy-five percent of beneficiaries believe they now have fairer and more equal access to local forest resources, helping to make communities more resilient.



Nature: Despite the short implementation timeframe, 20,404ha of land are now under improved management plans. Overall, 11,619ha benefitted from improved natural resource management techniques, such as FMNR, planting of indigenous tree species and soil and water conservation practices and composting pits (zaï) to improve soil fertility

⁵² Source: June 2015; Alec Crawford; Climate change and state fragility in the Sahel

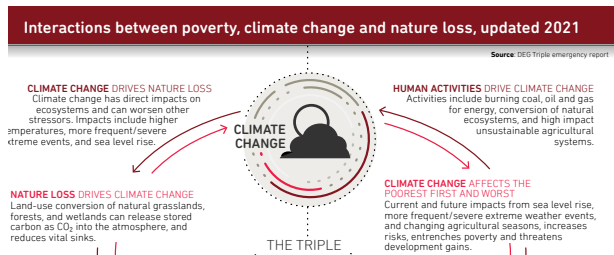
⁵³ (\$1.90 a day/Adult Male Equivalent) based on Total Value of Activities (Cash Income + Products consumed converted into local cash equivalents)

⁵⁴ 2,500 Kcal per day/Adult Male Equivalent

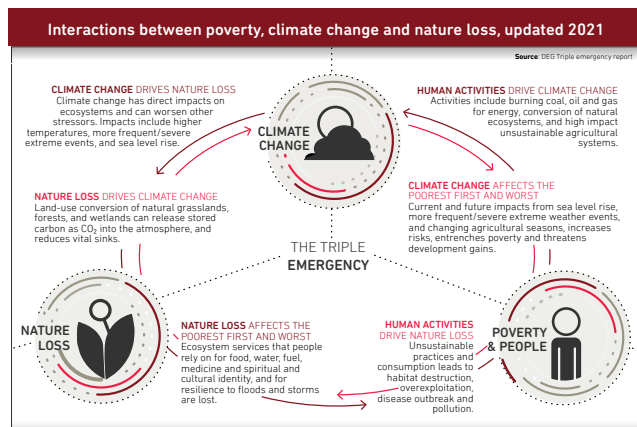
⁵⁵ Data collected through socioeconomic household level survey (<https://www.rhomis.org/>) and ecological survey conducted at project baseline (2017) and endline (2020).

and water retention. More than 345,000 new trees were planted, and 327,000 trees restored. In addition, 8,300 hectares of degraded forest land were restored to improve water retention and soil fertility.

Biodiversity has improved across all land-use systems: the number of tree species increased from 37 species in 2017 to 43 species in 2020. Six species have been returned to the area. Among them, *Cordyla pinnata*, a locally identified threatened species of significant importance to the community for both food and livelihood opportunities, was particularly welcome.



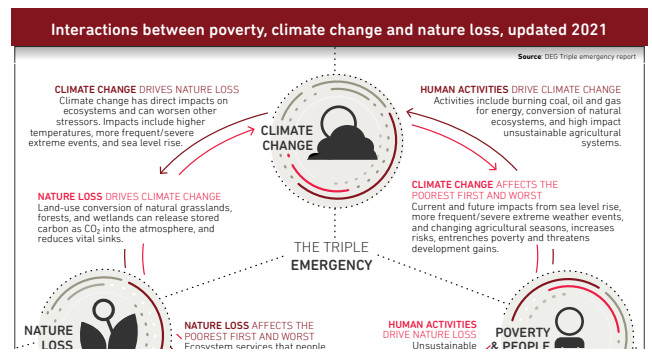
A study of tree distribution by diameter class has shown that fewer trees with a circumference above 30cm are being lost. In 2020, the percentage of trees with a diameter above 30 cm rose to 22.1%, from a figure of 16.8% in 2017. As a result of improved forest management, there were also more trees in the 80–99 cm circumference category in 2020.



These are extremely positive results that suggest a high rate of adoption by farmers of improved sustainable land-management practices. By the end of project, 1,435 farmers had participated in FNRM best practices training, and the proportion of households using FMNR techniques had increased from 33% to 86%.

Success factors

Participatory approach: The project established more participatory and inclusive forest governance, where decision-making processes are decentralised and promote the rights and responsibilities of local forest users who depend on the forests. Local communities (organised through two cooperatives) were supported to take on stewardship of two communal forests through a forest dialogue group and a steering committee. These provided



People: The project helped establish 44 viable community-led small NTFP-based businesses called Village Tree Enterprises (VTEs), where local people work in groups to develop products and share the benefits equally (mainly from shea trees and honey). Enterprises received organisational and technical support to improve production processes, product quality, and business and financial skills. VTEs also received materials to improve packaging and labelling. They can support each other, running savings and loans schemes, and trade as one entity — through which they can often negotiate better prices for all their members.

For example, the two inter-communal cooperatives of Farakunna and Hirosin received modern shea and honey-processing units and training to increase product volume, quality and sales. Members took part in marketing skills training and learning exchanges. Local radio stations were used to provide market information and improve the flow of data between producers and buyers about products and prices.

At the beginning of project, neither cooperative had access to national or international markets. By 2020, both cooperatives reported access to national markets due to project support, with Farakunna reporting 50% of its honey sales at national level, while 25% of Hirosin’s sales of shea and 7% of its honey sales were made at a national level. Hirosin also reported 3% of its honey sales were at an international level.

By the end of the project, 52% of the project population were below the poverty line (\$1.90 a day/Adult Male Equivalent) based on Total Value of Activities (Cash Income + Products consumed converted into local cash equivalents) — a reduction of 34%. Fifteen percent of the project population were below the calorie line (2,500 Kcal per day/Adult Male Equivalent), a reduction of 5%.

an open forum for discussion and addressing conflicts that may arise over natural resource use. Two hundred and eighty one brigade members (including 82 women) from local communities were trained to collect data in order to monitor forest stewardship efforts.

Improving incomes and market access by implementing NbS: The project helped set up 44 community-led,

NTFP-based businesses and supported them to improve production and expand market access.

Women's participation: The intervention provided women with an inclusive platform where they could meaningfully participate in managing forest resources and gain

improved access to NTFPs. This opened the way for women from poorer households to generate their own incomes. Women are more likely to invest in the long-term well-being of their households, for example by building up savings that can provide a buffer against climate shocks.

Resources

Tree Aid (2020). **Strengthening forest management to protect biodiversity and alleviate poverty in Mali, West Africa.** Tree Aid

Web pages: [project updates and blog](#)

Contact

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6. PERU:

Sustainable watershed management in glacial mountain ecosystems

Implementing partners	NGO: CARE Peru Financed by the Swiss Agency for Development and Cooperation (SDC) Project executed in consortium with the University of Zurich Government: Glaciology Unit of the National Water Authority, Regional Governments of Ancash, Cusco and Lima, Peru Ministry of Environment, Peru Ministry of Economics and Finance Community-based organisations: communities of Cusco and the Nor Yauyos-Cochas Landscape Reserve in Cañete, Lima Other: Meteodat, the Alpine Environment Research Center (CREALP), and the Federal Polytechnic School of Lausanne (EPFL)
Location	Ancash, Cusco, and Lima, Peru
Ecosystem types	Highland glacial mountain ecosystems with a mosaic of glacial lagoons, glacier-fed lakes and rivers, grassland and human settlements downstream
Operational scale	163 hectares in the Ancash, Cusco, and Lima provinces, covering many towns and landscapes, with potential benefits for human settlements and ecosystems many kilometers downstream
Time frame	2011–2019



© CARE PERÚ

The Challenge

Climate change: 71% of the world's tropical glaciers are found in Peru. Over the last 40 years, due to the impacts of climate change, the glacial surface of 18 snow-capped mountain ranges in the country has been reduced by 53%. The accelerated retreat of the glaciers often creates unstable lagoons and causes natural disasters such as alluvium landslides and deadly flash floods.

Nature: Many of Peru's freshwater ecosystems are fed by glaciers. Glacial melt is disrupting water flow and quality, posing a threat to the flora and fauna that rely on freshwater environments. Unsustainable management of fragile glacier ecosystems is causing environmental degradation and biodiversity loss. For example, in Cusco, many highland pasture areas have been degraded by overgrazing. This, coupled with increasing temperatures, has led to increased rates of evaporation from highland grassland, reducing available water in the landscape.

People: Ice and rock landslides from glacier melt generate waves that form deadly flash floods, inundating population centers and displacing communities, with women, children, poor, and indigenous communities most disproportionately affected.

The provision of water in Peru depends on the conservation of high mountain ecosystems that are responsible for the regulation, storage, and provision of water for consumption and irrigation by the entire country. Water deficits and droughts resulting from the loss of glaciers as a dependable form of water storage have worsened the food security situation, threatened the livelihoods of Andean farmers and multiplied the socioeconomic threats facing poor communities who rely on glaciers not only for water, but for food and energy production. For example, rivers fed by glacial meltwater are a critical source of irrigation for agriculture and energy for hydropower companies.

NbS implemented

The Proyecto Glaciares saw community-led, multi-stakeholder coalitions of scientists, public and private sector actors collaboratively develop water resources management plans to sustainably manage more than 200 new lakes. The project benefitted downstream communities and protected fragile high-altitude freshwater ecosystems. As part of those water resources management plans, communities working with other stakeholders have protected and restored wetland by replanting native species, protecting grassland and forests around important spring water resources, fencing tributaries for restoration of vegetation, and planting native

species on water banks to protect water resources. They have also established sustainable communal grazing plans to prevent overgrazing.

The project also trained smallholder farmers to carry out sustainable farming practices including the sustainable use of water. These NbS were combined with other measures: for example, building dams to harvest water from periglacial lagoons for the storage of rainwater and protection of wetlands, and the design and implementation of early disaster warning systems.

Achievements

Climate change: Restored and better-managed water resources and glacier ecosystems have helped to reduce the risk of landslides and flash floods for more than 70,000 people living downstream. In addition, women, Indigenous People and poor communities, who led these nature-based solutions, now benefit from access to climate information services, helping to protect their lives and livelihoods from natural disasters.

Nature: The project included the creation or strengthening of 34 water and sanitation service boards to sustainably manage natural and water resources. In addition:

- 143ha of wetland have been protected and restored
- 11ha of springs have been protected
- 200 new lakes have been created and sustainably managed.
- 30ha of water surface area have been restored in ten periglacial lagoons or rustic dams in high mountain areas. These are managed by communities and

water and sanitation service boards to store water and recharge and maintain wetlands.

The improved water supply has allowed new watering holes for wildlife to be created and mountain meadows to be restored.

People: Communities now have better access to water, improved income and strengthened capability and knowledge to manage climate change risks and water resources. Improved scientific knowledge, better public policies and local implementation skills also contribute to long-term poverty alleviation in Peru. Some of the achievements include:

- 1,000 small-scale farmers have gained greater skills in climate adaption, disaster risk management and integrated management of water resources;
- 73 farmers have been trained in good agricultural practices that sustainably and efficiently use highland water resources such as the periglacial lagoons;

- Four women-owned and operated companies have been created to sustainably produce and market products such as coffee, granadilla and honey
- Nearly 70,000 people living downstream from the glaciers have benefitted from early warning systems for landslides.

Success factors

Combining scientific knowledge with traditional knowledge helped to ensure that the design of the NbS solutions incorporated both local indigenous knowledge and robust scientific data. Combining science with local knowledge of flood risks also led to the creation of an early warning system for floods through the community mapping of flood-prone areas and evacuation routes. This system also helps communities and researchers collect and monitor data in the long term to inform the design of appropriate NbS and other measures to adapt to climate change impacts.

Combining NbS and grey infrastructure to meet a diverse set of short-term and long-term needs: As glaciers continue to retreat at a fast rate, NbS alone are not enough to sustainably manage water resources in a way that can meet the increasing demands for human consumption while preventing further loss of crucial habitats like wetlands. Combining the restoration of native vegetations and sustainable use of natural resources in key watersheds with grey infrastructure such as dams can help ensure long-term sustainable management of water resources while meeting immediate needs for irrigation, fishing and energy generation. This type of hybrid management can meet and balance water needs and generate broader stakeholder support for NbS. The NbS contributed to the adaptive capacity of the communities and utilised gender-sensitive CVCA methodology to identify adaptation measures aligned with Peru's NDC.

Multi-stakeholder partnership: Close collaboration amongst communities, researchers and government officials has strengthened collective management of resources and climate risks. Scientific and local knowledge on NbS is now integrated into government development plans, strategies, and investments. This has led to increased public and private investment

in sustainable water resources management. Increased monitoring capacity supported by the government of Peru enables more data to be used by researchers to inform the design of NbS and other measures, creating a virtuous cycle of long-term planning and implementation.

Strengthening of capabilities at the three levels of government (national, regional and local) and in academia has raised awareness of the importance of glaciers and the integrated management of water resources for political actors. Likewise, it has allowed dialogue and the exchange of knowledge between the scientific community and the public sector and increased the integration of scientific information into development plans, strategies, methodological tools and investment projects, such as in the use of flooding and landslide hazard risk maps. In addition, scientific information on the effects of climate change on glaciers and other natural resources has been incorporated into territorial development plans, led to the creation of the National Institute of Glaciers and Mountain Ecosystems, helped in the formulation of the multipurpose public investment projects for environmental protection and management, and allowed for the integration of community-based adaptation, disaster risk reduction, and integrated water resources management approaches in development plans agreed at the regional level.

Engaging women in natural resource management: Women are more aware of natural resource distribution and long-term risks and often bear most responsibility for securing long-term access to water for their families. By supporting women to be more active in communal decision making, communities are more likely to monitor and assess long-term risks and manage their natural resources sustainably for long-term benefits.

Resources

The **Proyecto Glaciares website** hosts a range of resources, including **infographics**, **videos** and **photo galleries**

DeMerritt-Verrone, P. (2020). **Taking care of our Mountains**. Care International.

Proyecto Glaciares (2020). **Modelling Future Lakes in Glacier Beds: First Experience in Peru**. Proyecto Glaciares.

Contact

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7. ETHIOPIA:

An eco-regional approach to ecosystem conservation and livelihoods in the Bale Eco-region

Implementing partners	NGO: Farm Africa Government: Government of Ethiopia, Oromia State Authorities Other partners: SOS Sahel, FZS, PHEEC, IWMI Funding: European Union's Supporting Horn of Africa Resilience (SHARE) initiative, Royal Norwegian Embassy
Location	Bale Eco-region (BER), Ethiopia
Ecosystem types	The Bale Eco-region covers a wide range of ecosystems: Mountain ecosystem (highland areas) including forests, grassland, and freshwater Lowland areas include grassland, freshwater and agriculture ecosystems The Eco-region includes the area of the Bale Mountains National Park
Operational scale	First phase of integrated landscape management intervention (SHARE 1): 850,000-hectare forest and rangeland area working with seven woredas, in addition to the circa 214,000ha of the Bale Mountain National Park SHARE 2: about nine million ha, with potential to benefit about 12 million people across the region
Time frame of the case study	SHARE 1: 2014–2018 SHARE 2: 2019–present Note: both build on Farm Africa's work in Bale Eco-region since the 1990s



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The Challenge

Climate change: The Bale Eco-region (BER), and the south-eastern part of the pastoral and agro-pastoral setting in particular, are susceptible to frequent droughts and erratic and unpredictable rainfall. Forest and rangeland communities' resilience to these climatic changes is limited. Climate-related events also contribute to significant soil and water erosion. Deforestation and degradation of land are increasing carbon emissions, and the alteration of hydrological cycles due to land degradation further increases vulnerability.

Nature: The upland catchments of the BER are under strong anthropogenic pressure with high rates of degradation and deforestation. Highland grazing areas

were being rapidly converted to agricultural use, putting pressure on traditional grazing practices and transhumance. Unregulated use of grassland and forest resources and land conversion have resulted in soil erosion, flooding, drought and a negative impact on BER water table levels.

People: The above challenges, particularly disruption of the hydrological cycle for both upstream and low stream communities, combined with weak policy implementation and lack of cross-sector integrated policies resulted in communities being chronically food insecure, vulnerable to climate change impacts and exposed to disruption of their means of production.

NbS implemented

In the first phase (2014–2018), the overall objectives of the intervention were: to enhance drought resilience and the food and nutrition security of vulnerable populations in South Eastern Ethiopia; to protect biodiversity, ecosystem functions and services in BER; and to increase the resilience and well-being of highland /lowland communities.

Nature-based activities implemented include:

- Diversifying crops and enhancing productivity of existing agricultural land through agroforestry and climate-smart agricultural techniques (including diversified farming, row planting, mulching, terracing and improved seeds) to improve resilience and nutrition without the need to expand farmland
- Conservation and sustainable use of forests through training local communities to better produce non-timber forests products like honey, bamboo, forest coffee and natural oils in order to diversify livelihoods away from agriculture and livestock-keeping which are key drivers of deforestation

- Livestock interventions, including improved breeding via AI, development of forage, support for community animal health workers (CAHWS) and improved water access
- Better management of grazing lands and livestock health
- Development of ten nature-based water platforms (including four community ponds) for both humans and livestock.

In a second phase (ongoing), the successful integrated NRM package is being scaled up to the entire region. The institutional capability of the government to plan and co-ordinate integrated sustainable natural resources management, protected area management and interdependent inclusive livelihoods development in the BER is being enhanced. Best practices for protected area management, watershed systems, and improvement of local livelihoods through market approaches are being scaled up, with larger-scale evidence being collected on the impact of this integrated eco-regional approach.

Achievements

Climate change: The SHARE project supported adaptation by achieving:

- Improved resilience and adaptation for 878,000 households through more resilient crop varieties, improved livestock breeds and improved water access
- Construction of three monitoring stations to support enhanced monitoring of and adaptation responses to climatic impacts on water supplies, particularly sediment.

It supported mitigation through:

- The reduction of the deforestation rate by 62% versus the predicted model
- The reduction of land-use conversion of forest and grassland to agriculture

- The reduction of household fuel wood consumption per week by almost 50%.

Nature:

- Brought 500,000 hectares of forest under participatory forest management schemes to reduce pressure on the forest and support natural habitat regeneration and biodiversity
- More than 350,000 hectares were allocated for participatory land-use plans, involving 10 villages and 14 participatory rangeland management cooperatives.
- The density of trees <1m height in core forest areas increased from 64,115 trees/ha to 76,939 trees/ha
- Government and community institutions have increased their involvement in sustainable conservation and management

- Community Controlled Hunting Areas (CCHA) brought 38,528 hectares of land under joint managed control, with hunting revenue shared with the community. The incentives provided by the benefit-sharing arrangement led to a reduction in forest usage and supported improved biodiversity.

People:

The SHARE project implemented integrated livelihood interventions across seven catchment areas comprising a total of 1,406 households (HH). Final evaluation shows the following improvements:

- Increased net household income from ETB 6,867 (\$174) at baseline to ETB 18,961 (\$482) at endline
- Increase of 33% in dietary diversity scores and an increase in household food security, shown in an increase in average meals per day
- Diversified livelihood opportunities for the targeted 1,406 HH

- Increased overall crop productivity due to improved varieties and improved farming practices. Productivity improved for five key crops (see below)
- Increased livestock productivity — an 18% increase in milk production per cow

Crop	Baseline (mT/ha)	Endline (mT/ha)
Wheat	3.0	4.0
Barley	3.0	3.8
Maize	3.2	4.2
Sorghum	2.8	3.6
Lentils	1.6	2.2

- Reduced animal disease occurrences, narrowing the critical food shortage periods
- Improved access to safe water (from 26% to 38% of targeted HH) and reduction of water shortage episodes, reducing the migration in search for water — for both humans and livestock.

Success factors

A participatory approach: The involvement of multiple communities who depend on the resources across a variety of ecosystems is essential to their sustainable management, and communities and government require support and frameworks to facilitate their joint engagement.

A holistic and multi-sector approach to conservation: The approaches designed recognised highland-lowland linkages between forest and rangeland ecosystems, and the multifaceted nature of natural resource management problems across changing landscapes and regions. The Bale Eco-region Development Framework (BERDF) adopted follows a geographical/ecological boundary, rather than an administrative one, and recognises that the interaction between ecosystems needs to be considered to ensure positive outcomes from interventions.

The eco-regional approach to manage trade-offs: Different sectors and stakeholders have different and sometimes competing priorities and dependencies on ecosystems and natural resources. The eco-regional approach recognises those differences and tries to manage trade-offs amongst them through multi-sectoral and multi-agency engagements.

Creating more supportive government policies at regional and federal levels: SHARE 1 played a critical role in the Ethiopian government's decision to adopt participatory forest management (PFM) as a vehicle for REDD+ implementation; it contributed to the government's sustainable and green growth initiatives via the development of national policies for PFM and the support for REDD+ implementation.

The research conducted under the SHARE project is also currently contributing to the development of a national policy framework for payment for ecosystem services schemes.

Integrated population, health and environment approaches: An integrated approach engaged communities on interlinked challenges and helped to shift communities' perceptions, especially concerning health and family planning. Longstanding sociocultural taboos were addressed, and attitudinal change in family planning is contributing to livelihood improvement and sustainable natural resource management by reducing population pressure on natural resources.

Resources

Lemenih, M, Allan, C, et al. (2015). **Making forest conservation benefit local communities: participatory forest management in Ethiopia.** Farm Africa

Lemenih, M and Biot, Y (2017). **Reducing Deforestation and Emissions in What's the incentive for local communities?.** Farm Africa.

Hagos, F and van Rooijen, D (2018). **Investigation of the Modalities for an Innovative Financing Mechanism for Participatory Natural Resource Management in the Bale Eco-region, Ethiopia.** IMI Working Paper. DOI: 10.5337/2018.215

Contact

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8. CAMBODIA:

Increasing rice profitability to reduce forest and wetland clearance

Implementing partners	NGO: Wildlife Conservation Society WCS (INGO), Sansom Mlup Prey SMP (local) Government: Ministry of Environment Private sector: IBIS Rice Conservation Co., Ltd (IRCC) Community-based organisations: village marketing networks
Location	Cambodia, across three provinces (Preah Vihear, Stung Treng and Mondulkiri) and six wildlife Sanctuaries (Kulen Promtep, Preah Rokha, Chheap, Western Siem Pang, Keo Seima)
Ecosystem types	Dry tropical forest, semi-evergreen and evergreen tropical forest, community agricultural land within
Operational scale	4,530 hectares of agricultural land under monitoring and compliance affecting 974,000 hectares of wildlife sanctuary
Time frame of the case study	2009–present



The Challenge

Climate change: Climate change has resulted in increasingly unpredictable rainfall patterns. Local communities, who depend on rain-fed paddy or upland rice fields for their livelihoods, are extremely vulnerable to those changes as they rely on rain for irrigation and lack access to good quality seeds that are tolerant of rainfall variability. Due to unsustainable farming practices, many fields also have poor ability to retain water in the soil.

Nature: The forests and wetlands of northern Cambodia and the Tonle Sap region are of exceptional importance for biodiversity conservation. They support more than 50 species of global conservation concern, including six critically endangered birds, among them giant and white-

shouldered ibises. Taken together, four protected areas in this region (Chaep Wildlife Sanctuary, Kulen Promtep Wildlife Sanctuary, Preah Rokha Wildlife Sanctuary) cover more than 300,000 hectares of forest and wetland that also support more than 20,000 people. Over-hunting and conversion of forests to agricultural lands are the key threats to biodiversity in this region.

People: The people living in this region are amongst the very poorest in Cambodia and depend on the forest and land resources of the parks for their livelihoods. The main cash crop is rain-fed rice, but farmers have limited access to markets and opportunities to sell are inconsistent, with the result that purchasing power remains with middlemen.

NbS implemented

The IBIS Rice approach, initiated in 2009, was conceived as a means of generating incentives to reduce forest and wetland clearance by benefiting local people. Crucially, these incentives are created by increasing the profitability of rice production, the principal livelihood activity of smallholder farmers within the project area.

Under the programme, each participating household signs a conservation agreement which commits the household not to expand their existing land or clear additional areas of forest. Households who implement the conservation agreement are guaranteed a minimum price for their rice crop — phka rumduol (a local award-winning variant of

jasmine rice) — provided that required quality standards, including organic certification, are met. This provides certainty to producers and a 40% premium above the market price for their rice. Multiple climate resilience interventions also support the sustainability of production, including land levelling for water control, cover crops to improve soil fertility, structure and water retention. In addition, the project gives farmers free access to high-quality, traditional rice varieties which can adapt to different planting and harvesting schedules, depending on rainfall.

Achievements

Climate change: Climate change adaptation. More than 1,400 households now receive high-quality seed that can be replaced if lost to drought or flood. Rice fields were mechanically levelled to improve water management, and green manure crops were applied to more than 800 hectares of farmland to improve water retention and improve yields. Reduced deforestation around target villages and key water sources also improves access to water when rainfall patterns become increasingly unpredictable.

Nature: Participant farmers are four times less likely to clear new areas of forest or expand existing agricultural land than non-participant farmers (1.8% annual clearance probability vs 7.2%⁵⁶). Awareness of critical species has

increased, and hunting has been reduced by linking premium payments to compliance.

People: Participation in IBIS Rice increases household economic well-being and household rice surplus for sale (that is, annual production minus household consumption⁵⁷). The average annual earnings of those participating in the programme have more than doubled: increasing from US\$455 in 2009–2011 to US\$1020 in 2015–2017. This was achieved through improving productivity as well as an increase in market premium from 40% to 70% above market price, which was made possible by reaching export markets that valued the quality, certifications and conservation story.

Success factors

Linking benefits to people with benefits to nature by establishing successful businesses that sustain those benefits: Success has come from a focus on the crop that is most relevant to the communities targeted and the ability to link this to a high-end market that can

sustain and improve a premium. This has been achieved by taking a businesslike approach to the product and reaching an export market. Those premiums are only paid to participating households that sign a conservation agreement.

56 Clements et al. 2020

57 Clements et al. 2020

Multi-stakeholder partnership: This speaks also to the importance of having partnerships that allow stakeholders to specialise and play to their strengths. In this case, these were:

- An ambitious private sector partner that imbeds positive impacts on people, nature and climate into their unique selling point (IRCC)
- A science-based organisation managing monitoring, landscape management and compliance (WCS)
- A local organisation that imbeds itself in the community to build capabilities and improve agronomy
- Government buy-in to the intervention and real benefits and transparent approach for communities.

Resources

Clements, T, Neang, M, et al. (2020). **Measuring impacts of conservation interventions on human wellbeing and the environment in Northern Cambodia, 3ie Impact Evaluation Report 106**. New Delhi: International Initiative for Impact Evaluation (3ie). DOI: 10.23846/DPW1IE106

IBIS Rice website and **Facebook page**

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9. THE GREATER GOLA LANDSCAPE, SIERRA LEONE AND LIBERIA:

Forest conservation for nature, climate and people

Implementing partners

NGOs: Royal Society for the Protection of Birds (RSPB), Conservation Society of Sierra Leone (CSSL), Society for the Conservation of Nature of Liberia (SCNL), BirdLife International
Government: Government of Sierra Leone, Ministry of Agriculture and Forestry, and National Protected Area Authority; Government of Liberia, Forestry Development Authority
Other: Gola Rainforest Conservation Limited by Guarantee (GRC LG)

Location

The Greater Gola Landscape, Sierra Leone and Liberia

Ecosystem types

Tropical forest

Operational scale

Over 500,000 hectares

Time frame of the case study

In Sierra Leone, 2015 to present
In Liberia: 2014–2020
Note: both build on RSPB's work in the Greater Gola Landscape since 1994



© Guy Shorrock, RSPB Images

The Challenge

Climate change: Sierra Leone and Liberia are vulnerable to more frequent extreme weather events (including heatwaves and storms) and increased irregularity of rainfall due to climate change.⁵⁸ Extensive tree cover loss in the region also releases stored carbon, fuelling climate change.

Nature: The Upper Guinean Forest Eco-region (part of only three forested biodiversity hotspots in Africa) has lost 90% of its forest since 1900 and has been identified as one of 20 'deforestation fronts'.⁵⁹ Of what remains, 49% is in Liberia and 4% in Sierra Leone. The Greater Gola Landscape comprises the largest remnant of this critical ecosystem in a mosaic of protected forest, community forest, and agricultural lands. These wildlife corridors

are vital for threatened species, many of which are found nowhere else. Over 60 of Gola's species are globally threatened, including the Endangered Gola malimbe and pygmy hippopotamus.

People: Sierra Leone and Liberia are among the world's most fragile countries. Forest communities are highly dependent on natural resources, and subsistence agriculture accounts for a large proportion of livelihoods. The civil wars — together over a decade long from the 1990s to early 2000s — decimated a whole generation, contributing to loss of traditional knowledge and skills (for example in cocoa farming). In some areas, degradation of agricultural lands and poverty drive communities to clear forest for farming.

NbS implemented

We are working with partners and communities across Sierra Leone and Liberia on projects designed to protect and sustainably manage the Greater Gola Landscape, using a landscape-scale and transboundary perspective.

Developing effectively managed and well-connected protected areas across borders: RSPB and its partners, including CSSL, SCNL and GRC, have been working with governments and local communities across both countries to support the creation of legally protected areas.

In Sierra Leone, the Gola Rainforest National Park (GRNP) was inaugurated in 2011, covering 71,042 hectares with the surrounding forest-edge communities adding 70,000ha. In Liberia, the Gola Forest National Park (GFNP) was created in 2016, protecting 89,033ha. The two countries signed an MOU (signed 2011, updated 2020) committing to the conservation of the Gola Peace Park, encompassing the GRNP and the GFNP.

In Sierra Leone the Gola Rainforest Conservation Company (GRC LG) manages the GRNP.⁶⁰ The GRC employs park rangers to combat illegal activities, undertakes annual monitoring programs to assess deforestation and key species trends, and supports local volunteers. In Liberia a management plan for the GFNP was recently validated and activities will initially focus on law enforcement.

Ensuring forest connectivity and community support: In Liberia, a project run between 2014–2020 aimed to secure forest connectivity through community forest management of the section of the Gola Forest outside protected areas.

This was a partnership between forest communities, the Government of Liberia, and the international conservation community. Two legally recognised community forests were established, connecting the GRNP, GFNP, and the Foya Proposed Protected Area (165,000ha). There are plans to establish five other community forests in Liberia (all 10,000–30,000ha) and 15 others (<1,000ha each) in Sierra Leone.

Supporting rainforest-friendly livelihoods: RSPB and partners run initiatives supporting rainforest-friendly livelihoods with communities adjacent to the GRNP and GFNP. Activities include promoting sustainable agriculture techniques and alternate livelihood activities such as beekeeping, running farmer field schools, and hosting microfinance and literacy programmes. In Sierra Leone, GRC is supporting a gender-inclusive cocoa producers' organisation to rehabilitate cocoa farming around the GRNP and to market quality, sustainably grown forest-friendly cocoa to international markets. GRC also provides nitrogen fixing plants and shade trees for cocoa farms. Work to establish a similar forest-friendly value chain in Liberia is ongoing.

Activities in Sierra Leone are supported by a REDD+ (Reduced Emissions from Deforestation and Degradation) project which encompasses the GRNP and the surrounding seven chiefdoms.⁶¹ In Liberia, activities are underpinned by community forest management agreements and financial sustainability business plans.

58 <https://www.adaptation-undp.org/resources/project-brief-fact-sheet/sierra-leone-fact-sheet-sep-2013>

<https://www.adaptation-undp.org/resources/project-brief-fact-sheet/national-adaptation-plan-process-focus-lessons-liberia>

59 https://www.fint.awsassets.panda.org/downloads/deforestation_fronts_drivers_and_responses_in_a_changing_world_full_report_1.pdf

60 GRC LG is a not-for profit company comprised of a partnership between the Government of Sierra Leone, RSPB, the Conservation Society of Sierra Leone (CSSL) and local forest-edge communities.

61 The REDD+ project is validated under the Verified Carbon Standard, and the Climate, Community, and Biodiversity Alliance standard.

Achievements

Climate change: The long-term conservation of the forests is now more secure, and the forests can continue as an important carbon store. In Sierra Leone, between 2012–2019, the net estimated emission removals (through sequestration) in the REDD+ project area was 460,000 tCO₂e, and the net estimated emissions reductions (avoided emissions) was over 3 million tCO₂e. Modelling suggests that avoiding deforestation across the Gola Landscape can lead to avoided greenhouse gas emissions in the order of >800,000 tonnes a year. The project is also improving the forests' resilience to climate change stresses and strengthening the resilience of local communities through supporting diversified livelihoods and education.

Nature: The project helps to preserve Gola's wide biodiversity, including 327 bird species, 650 endemic plant species, over 600 butterfly species, and 49 species of large mammals. Monitoring suggests that seven Critically Endangered or Endangered species are benefitting from reduced threats. For example, Gola's chimpanzee population is stable, making it the only site in West Africa where the population is not decreasing.

In Sierra Leone, the REDD+ project was awarded Double Gold certification for its direct benefits to biodiversity and climate change. It has resulted in an estimated 9,228 hectares of reduced forest loss, and 2,190 ha of non-forest land with improved land management. Data for one of the

chiefdoms (Malema) shows that the deforestation rate was half that of outside the project zone.

People: The projects are benefitting over 50,000 people in forests adjacent to the GRNP and GFNP.

In Sierra Leone, project income has employed over 150 local staff and helped to develop sustainable and improved livelihoods for over 24,000 people across 122 communities. For example, over 2,000 community members have attended farmer field schools, half of them women, and 1,750 cocoa farmers are now Fairtrade certified. GRC has exported 92 tonnes of forest-friendly cocoa into the international market on behalf of the farmers' association, and income from the sales of RSPB Gola forest-friendly chocolate is ringfenced for the Gola project. Benefit-sharing agreements have given each of the Gola chiefdoms in Sierra Leone the funds to develop local projects of their choice, including building infrastructure like hospitals, water pumps and schools, and funding secondary school scholarships (over 700 a year).

In Liberia, project activities from the community forests program have decreased poverty levels and increased well-being. In a survey at the end of the project, 56% of households stated that their well-being had improved, 74% said they've acquired new skills or knowledge, and 70% reported improved income.

Success factors

A participatory approach and collaborative working:

From the start, the projects have followed participatory approaches with a diverse range of local community members. Collaborative transboundary working will continue to be key for effective landscape-scale conservation and community support.

Scientific underpinning: The projects are based on detailed, systematic scientific studies.

Developing sustainable financing mechanisms: The Sierra Leonean and Liberian governments don't have the revenue to protect their forest alongside competing development interests. Without financing from the REDD+ project, RSPB support, grant money, and the legal frameworks created by

establishing National Parks, the forests would have been at great risk of loss to agriculture, mining, forestry and poaching. The RSPB is committed to the Gola Forest in the long term; in the UK and in Sierra Leone, trust funds aim to ensure that climate, biodiversity and community benefits extend beyond the life of the REDD+ project.

Continued work in times of crisis: The project continued during civil wars and the Ebola crisis. During the latter, staff salaries were paid throughout, although there was a lockdown and the crisis lasted for some time. This was possible due to ongoing donor and grant projects and the significant amount that RSPB invested annually. This was similarly the case during the more recent COVID-19 crisis.

Resources

Storymap: **Conserving West Africa's Forests for Nature, People and Climate**

RSPB webpage, **Working for the Greater Gola Landscape**

Website: **Gola Rainforest National Park**

Website: **Society for the Conservation of Nature in Liberia (SCNL)**

Contact

For more information visit **RSPB's website** or contact **Fiona Dobson**, International Policy Officer, RSPB **Email:** fiona.dobson@rspb.org.uk

10. KENYA

Transforming lives and land with sand dams and climate-smart agriculture

Implementing partners	NGO: Excellent Development and Africa Sand Dam Foundation (ASDF) Community-based organisations: community self-help groups (SHGs)
Location	Three counties in southeast Kenya: Machakos, Makueni, and Kitui
Ecosystem types	Semi-arid drylands, agricultural land
Operational scale	60 communities across the three counties on around 4,320 hectares of farmland
Time frame of the case study	2010 to present (Evidence collated between 2011–2021)



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The Challenge

Climate change: Increasingly erratic rainfall has resulted in prolonged periods of drought, which are frequently and increasingly followed by flooding when the rains arrive.

Nature: Grasses and trees have been lost due to drought, and unsustainable farming, and overcutting of trees has resulted in topsoil loss, further reducing the land's ability to retain water.

People: Successive droughts compounded by poverty have led to persistently unstable water supplies and declining agricultural productivity in semi-arid regions of southeast Kenya.

50% of households in the 60 communities live below the poverty line (with household income of less than 3,000 Kenyan Shillings (US\$30) per month).

100% of the households have to employ at least one food saving strategy, for example skipping meals or reducing meal sizes, and 48% do not have a balanced diet.

Community members are spending on average 5–6 hours to collect water. The time taken can increase further in the dry season, a burden that usually falls on women and children, causing children to miss school.

NbS implemented

Sand dams are a sustainable, low-cost rainwater harvesting technique, highly effective at transforming drylands. A sand dam is a reinforced stone masonry wall built across a seasonal sandy river. They have almost no maintenance costs and can last for upwards of 60 years (the oldest known sand dam in operation is over 100 years old).

Built in seasonal river channels, they result in a gradual accumulation of sand in the river over the course of one or two rainy seasons. The sand, which is washed down during the rainy season, then protects water from contamination and evaporation.

Water behind a sand dam raises the water table in the surrounding area, which improves the soil, creating better conditions for crops and grazing. More trees can be planted which ensures that more water infiltrates the ground, and less soil is washed away — creating a virtuous cycle of soil and water conservation.

The sand that is accumulated behind the dam can store up to 40 million litres of water and is replenished every

rainy season to provide year-round water. Only 1–3% of the total rainfall is stored behind the dam; around 97% continues downstream, so that the dams do not negatively impact downstream users. Sand dams enhance the resilience of the marginal environment and increase the adaptive capacity of drylands. They raise groundwater levels, enabling vegetation regrowth, reducing soil erosion, reversing land degradation and increasing the productivity of the land. Once the sand dams are built, nature does the rest!

As part of this intervention, local communities are also trained in sustainable farming practices, including using drought-tolerant seed varieties and avoiding an over-reliance on maize. Communities additionally employ soil conservation measures such as terracing the land and the riverbanks near the dam to prevent soil run-off, and also to prevent the dam from silting up. Tree nurseries are also established, and communities are encouraged to plant trees around the dam sites and on their own farms.

Achievements

Climate change: Sand dams have provided a local, clean water source for communities, which has helped alleviate the impact of droughts. The use of drought-tolerant seeds has increased community seed and food security, whilst tree planting and other soil protection measures have increased communities' adaptive capacity and reduced their vulnerability to climate change.

Nature: There has been a 263% increase in the proportion of households planting trees. Approximately 1,800 households were included in this study. Around 432 households were planting trees at the start of the project; this figure has risen to around 1,548 households planting trees now. These are native trees: a mix of species such as mango, citrus, acacia and many others.

There is also anecdotal evidence from communities (and ASDF staff) about re-greening of areas, more shade and increased biodiversity of both flora and fauna, with more butterflies and birds in the area.

People: Over the last ten years, there has been a 74% reduction in the number of households living below the poverty line. Only 11% of households now have to employ a food-saving strategy, compared with 100% at baseline. And only 22% households still do not have a balanced diet — compared to 48% at baseline.

The time needed for water collection has reduced significantly and is now around an hour, enabling children to go to school and women to engage in income-generating activities.

Success factors

Community-ownership: ASDF only work with organised self-help groups who actively request support, thereby ensuring full buy-in from the community.

Long term support: Communities are engaged in the project for 3–5 years to ensure new practices are well embedded.

A holistic model: Sand dams were combined with sustainable farming techniques and environmental

restoration measures such as terracing and tree planting. Sand dams are a simple, low-cost and low-maintenance replicable technology. They have a natural ability to raise the local water table and re-green areas. Because they don't require maintenance, the dams will continue to benefit areas for decades to come without further intervention.

Resources

Ryan, C, Elsner, P (2016). **The potential for sand dams to increase the adaptive capacity of East African drylands to climate change**, in *Regional Environmental Change* 16, 2087–2096 (2016). DOI: 10.1007/s10113-016-0938-y

Quinn, R et al.(2018). **An Assessment of the Microbiological Water Quality of Sand Dams in South-eastern Kenya**. In *Water*, 10(6), p.708. DOI: 10.3390/w10060708.

Excellent Development Annual Report 2019/20

Excellent's 2020/21 Annual Report will be published in September 2021

Taylor, J, Ogonjo, O et al. (2016). **Food security through increased access to water and food production in Kenya**. (External Evaluation on the DFID-funded programme 2013–2016). Sahel Consulting.

Animation: **What is sand dam?**

Web pages providing impact stories (multiple)

Contact

For more information visit **Excellent Development's website** or contact **Dwain Lucktung**, Communications Manager, Excellent Development
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11. PAKISTAN:

Mangrove protection in the Indus Delta

Implementing partners

NGO: WWF-Pakistan, IUCN Pakistan

Government: Sindh Forest Department, Sindh Coastal Development Authority, Planning and Development Department, Sindh Fisheries Department, Sindh Wildlife Department, Pakistan Council for Renewable energy and Technology (PCRET)

Private sector: Several corporate donors such as Southern Sui Gas Company and Engro Foundation

Community-based organisations: Several local community-based organisations based in the Indus Delta

Other: Several academic institutes

Donors: Royal Embassy of Netherlands, European Union, BMZ

Location

Indus Delta, Sindh Province, Pakistan

Ecosystem types

Mangrove, estuarine and littoral habitats

Operational scale

42,000 hectares

Time frame of the case study

From 2007 to present⁶²



© WWF-Pakistan

62 WWF-Pakistan has been working in the Indus Delta since 1980.

The challenge

Climate change: In the past three decades, the Indus Delta has faced severe pressures due to climate change, such as erratic rainfall, severe drought, increased incidence of cyclones and storms and increased rate of erosion and accretion due to sea level rise.⁶³ As a consequence, the land adjoining the delta has lost its fertility and remains waterlogged, with persisting hyper-saline conditions throughout the year.⁶⁴ Groundwater recharge is low, depleting due to a significant reduction in freshwater flow in the Indus River. According to the Pakistan Water Apportionment Accord of 1991, the Indus Delta should receive at least ten million acre-feet (MAF) of water annually. However, currently not even one MAF reaches the delta.⁶⁵ This is the reason why nearly one million people living in the region still do not have reliable access to safe drinking water. More than 25,000 inhabitants in the Delta's coastal towns in Thatta district are extremely vulnerable to sea level rise and storm surges. Households living along the tidal creeks are exposed to risks of severe damage, making the coastal communities highly vulnerable to climatic shocks as the degradation and overexploitation of mangroves continues.

Nature: The Indus Delta covers an area of 600,000ha and is rich in biodiversity.⁶⁶ Mangrove forests are the flagship species and provide habitat for 63 species of fish, 24 shellfish species and a wide variety of birds, marine mammals and other marine fauna. They are also an important habitat for hundreds of thousands of migratory birds.

Approximately 60% of the mangrove cover across the Delta has been lost during the last 70 years, and what remains is low-density forest. Today, only four out of eight mangrove species are found in the delta.^{67,68} Many fish species have declined in numbers, and some are locally extinct. The population of the hilsa (*Tenualosa ilisha*), once a symbolic fish of the delta and a delicacy in Sindh, has declined by up to 90%.⁶⁹

People: The average monthly income of most households is PKR6,000 per month, which is less than US\$2 a day. Most communities in the delta live below the poverty line with very little access to basic services such as safe drinking water, electricity, health facilities and education. As fishing resources deplete, fishing becomes a costly business with low returns. Local communities which rely heavily on fishing for their livelihoods often have to take loans from middlemen through informal contracts to cover the costs of fishing and subsistence. Fishers are often charged exorbitantly high interest rates (as much as 164%). In order to repay the loans, they have to fish more, exacerbating the pressure on a rapidly depleting resource.⁷⁰ There are few opportunities to diversify livelihoods from fisheries; traditional agriculture has been significantly reduced due to the lack of freshwater and the hyper-saline and waterlogged conditions of the land. Government and private investments in mariculture/aquaculture are very low, despite the significant potential in the Indus Delta.

NbS implemented

WWF-Pakistan supported local communities to develop sustainable natural resource management strategies. These included establishing cold storage systems to reduce post-harvest losses in fisheries; reducing the use of small mesh nets, and encouraging sustainable crab harvesting and aquaculture for increasing sizes (including fattening of previously discarded small specimens). WWF-Pakistan raised public awareness of the important role of mangrove forests in coastal ecosystems and supported 11 local fishing communities to plant and manage ten hectares of mangroves per household across five villages. Communities have established mangrove management areas, where fuelwood collection is reduced, and renewable energy sources like solar power

have replaced fuelwood, at least for lighting purposes. Active collaboration between WWF-Pakistan and local communities has created a strong network of community champions for NbS, and this continues to inspire more communities to engage in sustainable management of mangroves.

In collaboration with the Sindh Forest Department and conservation organisations, a mangrove planting campaign was carried out to restore 42,000ha of mangroves to capture carbon, mitigate climate change impacts, restore habitats for wildlife and provide livelihood options for local communities.

63 (Robin et al., 1993).

64 (Mahar and Zaigham, 2021).

65 (Hasan et al., 2019).

66 Meynell, P. and T. Qureshi (1993) Sustainable management of mangroves in the Indus Delta, Pakistan', in David, T. (ed) Towards the Wise Use of Wetlands, Ramsar Bureau, Gland.

67 Meynell and Qureshi 1993 (N 5); Sindh Forest Department; IUCN Pakistan 2005; WWF-Pakistan 2008).

68 Amjad, A. S., I. Kasawani, and J.Kamaruzaman (2007). Degradation of Indus Delta mangroves in Pakistan. International Journal of Geology. Issue 3. Vol 1.

69 (Amanullah et al., 2014).

70 (WWF, 2007).

Achievements

Climate change and nature: GIS assessment indicates that the mangrove cover increased from 86,000 hectares to approximately 139,000ha in two decades in the Indus delta.⁷¹ Mangrove rehabilitation has improved coastal ecology and biodiversity. Native mangrove species have been restored across the delta, including the species *Rhizophora mucronata* in large quantities and *Aegiceras corniculatum* and *Ceriops tagal* in smaller quantities. These mangrove forests not only capture carbon but also help to reduce the risks posed to local communities by sea storms and cyclones, and also support the nutrient cycle in the mudflats.

People: The number of economically important marine species (such as shrimp and mud crabs) has increased,

which has in turn, has reduced the pressure on fish stocks and diversified livelihood opportunities for local fishing communities. Income generation activities in the target groups have increased by 30% compared to the 2007 baseline, and around a quarter of the increased income is due to diversified livelihoods. In some villages, where crab fattening is undertaken at the household level, monthly income generation has increased significantly, by as much as 21% depending on market rates. Anecdotal information suggests that around 10% of the fishermen are now free of debts related to loans from middlemen. Households are now able to make investments to improve health and hygiene, for example, through the constructing of toilets.

Success factors

Building consensus amongst different natural resource users: WWF frequently acted as a mediator; for example, in disputes between local communities and camel grazers. Both these groups utilised the mangroves but for different purposes, which led to conflict, and subsequently weak management of the mangroves. Building consensus amongst different natural resource users helped to develop shared management plans that are now implemented by all users.

Linking benefits for nature with benefits for people: Ensuring that mangrove restoration and protection also delivered increased income for local communities was key to securing their involvement and support.

Strong multi-stakeholder collaborations: Strong collaboration between key stakeholders, such as the forestry department, the coastal development authority and IUCN, ensured a coordinated approach and synergy among the activities led by different stakeholders. Locally placed core staff members from WWF also ensured continuous engagement and strong collaboration with local communities.

Robust communication strategy: This not only helped engage local communities but also society at large. For example, WWF worked with women who are on the frontline of mangrove rehabilitation work to showcase 'climate sheroes' and use their stories to inspire other community members and educate the general public.

Resources

Amjad, A. S., I. Kasawani, and J. Kamaruzaman (2007). Degradation of Indus Delta mangroves in Pakistan. *International Journal of Geology*. Issue 3. Vol 1.

Hassan, Daniyal, Burian, S.J., Bano, R., et al. (2019). **An Assessment of the Pakistan Water Apportionment Accord of 1991** in *Resources* 8, no. 3: 120. DOI: 10.3390/resources8030120 (cited on 2 July 2021, 6:54 pm)

Shahid, U. (2012). **A Case Study of Camel Grazing of Mangroves at Keti Bunder, Thatta.**

Mangroves of Pakistan: Status and Management WWF-Pakistan (2008). *Natural Vegetation Assessment* (Unpublished Report).

Leichenko, R.M. and Wescoat Jr, J.L. (1993) 'Environmental impacts of climate change and water development in the Indus delta region', in *International Journal of Water Resources Development*, 9:3, 247-261, DOI: 10.1080/07900629308722587

Mahar G. A. & N. A. Zaigham (2021). The Impact of environmental changes on indigenous agriculture in the Indus Delta Pakistan: a spatio-temporal assessment. In *Arabian Journal of Geosciences* 14: 303.

Meynell, P. and T. Qureshi (1993) Sustainable management of mangroves in the Indus Delta, Pakistan', in David, T. (ed) *Towards the Wise Use of Wetlands*, Ramsar Bureau, Gland.

Website: **ForeverIndus**

Web page: **Making a sustainable living from fishing in the Indus Delta**

Web story: **Ocean Witness: Salim**

Video: **Making money out of mud**

71 (Gilani et al., 2020).

News report: **Pakistan's coastal villagers retreat as seas gobble land**

Web page: **Government of Sindh Forestry Department: Mangroves**

Contact

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12. SUDAN:

Community-based land and water management

Implementing partners	NGO: Practical Action
Location	North Darfur State, Sudan: Wadi El Ku in the South and Kabkabiya in the North
Ecosystem types	Semi-arid rangeland, the wadis (ephemeral rivers/valleys) and their watersheds (the catchment of the rivers)
Operational scale	Wadi El Ku watershed in the southern part of North Darfur in Sudan: a catchment of 2,700,000 hectares, and a length of more than 100 kilometres Wadi Bargo catchment of Kabkabiya, a district to the east of the State capital, Al-Fashia, in the northern part of North Darfur of Sudan
Time frame	Wadi El Ku: 2012 to present Kabkabiya: 2013 to present



The Challenge

Climate change: In North Darfur in Sudan, rainfall has become less reliable (in terms of seasonality, intensity and overall levels) due to climate change. Most farmers in this area rely heavily on rainfed farming for hardy crops like millet and sorghum. At the same time, everyone relies on underground water to supply their animals and for domestic use. In areas of high demand, the availability of underground water has become increasingly limited. In areas where there is insufficient water and land, unreliable rainfall has caused agriculture yields to diminish and settlements to be abandoned, as farmers can no longer grow sufficient crops nor raise their livestock.

Nature: Declining rainfall has reduced plant density and diversity in rangelands; the grasses that can survive prolonged drought now dominate and these tend to be less nutritious and productive for animals. As a result, pastoralists and their livestock no longer have sufficient forage and have to move more. Overgrazing also degrades and deforests land, reducing biodiversity and increasing the risk of desertification.

Diminishing agricultural yields, largely caused by climate change, have forced farmers to expand into forest or rangeland areas. This deforestation increases

desertification and reduces the habitats of wildlife, putting even more pressure on rangeland. Deforestation is also exacerbated by an increasing demand for fuelwood and timber.

People: The UNHDI 2017 ranks Sudan amongst the least developed countries of the world (167th of 189 countries). Within Sudan, North Darfur State is the poorest, with 69% of its population living below the poverty line. According to OCHA-Sudan⁷², more than 1.4 million people are in need of humanitarian aid in North Darfur.

Competition over natural resources, including water, has triggered communal and tribal conflicts. Those conflicts are partly why half a million people in North Darfur are considered internally displaced people (IDPs). Around a fifth of the IDPs in North Darfur are in Kabkabiya, and they rely on wood for fuel and their livelihoods. As a result, deforestation has been more severe and rapid in areas near IDP camps.

Competition over water combined with local and national politics, including the division of Sudan into two countries, has also disrupted many traditional migratory routes used by pastoralists.

NbS implemented

The NbS activities implemented are integrated water resource management (IWRM) approaches that combine NbS with 'gray infrastructure' interventions to restore the land in and beyond the low-lying fertile wadis. Earth dams and crescent terraces are constructed to reduce run-off, increase infiltration and prevent gully formation. As part of rangeland rehabilitation, good-quality indigenous grass seeds were planted. Practical Action also supported communities to plant trees to restore communal forested areas and sustainably manage rangelands. The approach supports communities to see trees as a vital part of the rangeland and farmland — that is, to adopt an agroforestry approach. For example, communities were supported to

nurture or plant the local gum arabic tree (*Acacia senegal*) and realise financial benefits from it as part of their farm and land management.

The local communities (including pastoralists and farmers) have established inclusive natural resource management committees (representing different livelihood/tribal groups, as well as women, youth and so on). Through those inclusive committees, local communities plan and manage rangeland, farmland and water resources together to ensure equal and fair access, thereby reducing conflicts.

Achievements

Climate change: The most significant benefit has been the replenishment of underground water: for example, dry water points are becoming productive again and other water points can now provide water all year round, even when demand is high in the summer season.

In Wadi El Ku, earth dams and crescent terraces help recharge underground water and increase the survival rates of trees and shrubs planted on the banks of wadis. Those trees and shrubs in turn help to stabilise banks, combat land degradation and desertification and further recharge underground water, creating a virtuous circle. In Kabkabiya, Practical Action supported the repair of 29 hand pumps, the improvement of 12 wells and the upgrading

or construction of 17 boreholes (seven of which are now equipped with solar pumping systems). Farmers have also been trained to operate pumps and sustainably manage water resources to adapt to climate change.

In both locations, as groundwater recharges, local communities have more secure access to water to irrigate their crops and sustain their livestock.

Through participatory natural resource management committees, migratory corridors have been demarcated to allow free movement of livestock. This reduces conflicts between pastoralists and farmers. The corridors also provide pastoralists with better access to water, despite

72 HNO, Dec 2020

climate change, because they can move more freely to take advantage of areas that have better rainfall and better grass yield.

Nature: Local communities now sustainably manage their land and water in both areas of North Darfur (Wadi El Ku and Kabkabiya). Overgrazing has been reduced, which helps reduce the degradation and desertification of rangelands. Forests have been restored, and farmland and rangeland have become more productive through restoration and agroforestry practices.

For example, as part of Practical Action's work in Wadi El Ku, more than 18,000 tree seedlings were successfully planted on the sides of the wadi, and ten community forests covering around ten hectares in total have been created. More than 70% of households were involved in conservation or reforestation activities. The quality and quantity of grass for livestock has improved through the re-introduction of indigenous grasses from other less severely drought-affected areas. One hundred lead farmers now actively promote agroforestry. In Kabkabiya, 10,000 tree seedlings were produced and four community forests covering around 4ha in total have been created. Farmers were trained to undertake water conservation and agroforestry.

People: Current interventions in Wadi El Ku are working directly with around 15,000 households (nearly 100,000 people — farmers and pastoralists) in 29 villages. The interventions indirectly benefit the wider population (estimated at 700,000) in Wadi El Ku, because the recharged underground groundwater supports 110 water points. This is in addition to the people who benefit from

the improved land management — from cropping, livestock and forested areas. Interventions in Kabkabiya work in a similar way with training carried out not only on IWRM but also on finance and gender. These activities aim to influence the lives of people across 35 villages.

Social cohesion and co-existence between farmers and pastoralists improved as the different groups started to share existing resources. Improved land and water management improved yields and allowed communities to grow crops on previously degraded land rather than expanding into forests. In Wadi El Ku, eight villages have better access to water, thanks to the rehabilitation of two 'haffirs' (traditional ponds usually excavated in natural depressions, which have soils that hold the water). At the same time, over 34 kilometres of livestock migratory corridors have been demarcated, enabling pastoralists to improve their livelihoods.

In several villages in Wadi El Ku, household food security has improved as farmers were able to use irrigation to undertake farming activities outside the normal rainy season. An estimated 4,500 households benefitted from the three water harvesting structures constructed by Practical Action. Fifty-four percent of these households reported an increase in crop yields of 50% or more as a result of improved access to water on their farms along the wadi.

It is noticeable that because of reduced conflict over water and land, many people living in IDP camps are beginning to return to their villages, especially during the crop-farming season.

Success factors

Building consensus and catalysing collaborations: Conflicts among local communities and tribes were causing unsustainable use of natural resources by different user groups. Facilitating dialogues and building trust among different user groups allowed communities to resolve conflicts and reach consensus on how water and

land can be managed sustainably. Building on indigenous knowledge, local technical authorities and communities developed joint mapping of natural resources and catchment management plans that laid a foundation from which all stakeholders could collaboratively implement NbS.

Resources

Web page: [Nurturing livelihoods and peace through shared resources in Sudan's North Darfur](#)

Web page: [Turning the tables on Climate Change](#)

Web page: [How communities in Darfur are re-greening their lands for crops, forests and the future](#)

Video: Sudan: [Participatory 3D mapping in North Darfur \(part of the Wadi Elku IWRM project\)](#)

Video: Sudan: [Water Harvesting \(Wadi Elku project\)](#)

Video: [Sudan, Wadi Partners Food Security and Disaster Resilience \(WEK project\)](#)

Contact

For more information, visit [Practical Action's website](#) or contact **Chris Henderson** at Practical Action, UK
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13. UK:

Coastal managed realignment

Implementing partners	NGO: Royal Society for the Protection of Birds (RSPB) Government: Environment Agency (UK Government)
Location	Medmerry, West Sussex coast, UK
Ecosystem types	Coastal ecosystem including intertidal mudflats and saltmarsh, grassland, farmland, saline lagoons, freshwater ponds and ditches, reedbed, scrub, shingle beach (many of these habitats were created as a result of the work undertaken)
Operational scale	184 hectares
Time frame	2009–2013, building on years of planning and management work on the site



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The Challenge

Climate change: This section of England's southern coastline, including the small town of Selsey, was in extreme danger of flooding from high tides and storms. Projections suggest that the UK will lose almost 3,000 hectares of intertidal habitat by 2050 due to climate change, sea level rise and increased coastal erosion.⁷³ Natural intertidal habitats such as saltmarshes and mudflats would ordinarily absorb strong waves to reduce the depth and length of peak water levels and erosion from storm surges. When this habitat is lost, or when it is not able to roll naturally inland as sea levels rise, coastal communities are put at much greater risk of flooding. It is estimated that one in six people in England are living in properties which are at risk.⁷⁴

Nature: Since World War II, the UK has lost over 15% of its saltmarsh, 18% of its sand dunes, and 46% of its shingle habitat, and the state of the remaining habitats is poor.⁷⁵ Many of these habitats are of international conservation

importance as they are key for wildlife species, especially wetland birds and shorebirds.

People: The Selsey area has a high percentage of older people living on a low income. Many of these people don't have access to a car and suffer from health inequality.⁷⁶ The area also has one of the highest percentages of children in low-income households.⁷⁷ Access to nature is important for health and well-being, but access can be variable. For example, a recent study shows that children from ethnic minorities and from lower-income households spend less time outdoors.⁷⁸

In the town of Selsey, more than 300 houses, a main road and a water treatment works were extremely vulnerable to flood risks, causing emotional and economic stress to residents. Maintenance of the previous coastal defences, a three kilometre shingle bank, was costing the Environment Agency £300,000 per year.

NbS implemented

Managed realignment involves building new sea defences inland from the coast and allowing a new 'intertidal' area to form seaward of the new defences. This new intertidal area is exposed at low tide and covered by the sea during high tide. The Medmerry project involved the construction of seven kilometres of new flood bank inland from the sea, between the settlements of Selsey and Bracklesham Bay. Once the bank was complete, the existing shingle sea defence was breached, allowing the sea to flow inland and creating 184 hectares of intertidal habitat. The Medmerry project is one of the largest managed realignment schemes on the open coast in Europe.

The new flood bank was built using 450,000 cubic metres of clay which was extracted from within the site. In the process, along with the new saltmarsh intertidal habitat, a series of new freshwater ponds and reedbeds were created.

The saltmarsh is grazed at a low density, with sheep and cattle managed by tenant farmers, maintaining grasses to a height that allows wildlife to thrive. Additionally, with the help of farmers on environmental stewardship schemes, cereals and special wild bird seed mixes are grown on land next to the saltmarsh to benefit wildlife, helping to provide food and cover throughout the year for yellowhammers and other farmland birds.

Achievements

Climate change: The intertidal habitat created by the Medmerry project, including saltmarsh, acts as a blue carbon store, helping to mitigate climate change. Per unit area, coastal blue carbon ecosystems can sequester and store more carbon dioxide than any other ecosystem⁷⁹ and saltmarshes bury carbon around 55 times faster than tropical rainforests.⁸⁰ Furthermore, the managed realignment itself acts as a nature-based approach to adapting to the effects of climate change, making the local area much more resilient to sea level rise and storms.

Nature: Since the creation of the site, bird populations have flourished. For example, in 2019, there were peak counts of 72 shoveler in February (9% of the county total), 152 shelduck (21%) and 1321 teal in December (21%).⁸¹ The breeding and wintering populations of wading birds such as avocets, lapwings and oystercatchers have all increased significantly. Notably, avocets first bred at RSPB Medmerry in 2014, and in 2019, 22 pairs nested. Also in 2014, black-winged stilts bred, only the third successful breeding record in the whole of the UK.

73 RSPB Sustainable Shores Report, 2018

74 <https://www.confused.com/home-insurance/living-on-the-edge>

75 RSPB Sustainable Shores Report, 2018

76 <http://www.chichester.gov.uk/CHttpHandler.ashx?id=10810&p=0>

77 <http://www.chichester.gov.uk/CHttpHandler.ashx?id=10810&p=0>

78 <https://www.gov.uk/government/news/survey-reveals-inequality-in-children-spending-time-outside-during-pandemic#:~:text=Natural%20England's%20People%20and%20Nature,with%2057%25%20of%20white%20children>

79 Rogers et al., 2019 <https://www.nature.com/articles/s41586-019-0951-7>

80 Macreadie et al., 2013 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3704532/>

81 Sussex Bird Report, 2019

Wildlife-friendly ditch management — where banks and ditches are managed in rotation without compromising drainage function — is undertaken to optimise freshwater habitats for water voles, amphibians and dragonflies. The agricultural land within the area is also managed for nature, with approximately 24 hectares of arable land managed specifically for wildlife (with wild bird seed mixes, nectar flower mixes, and cultivated uncropped areas for nesting birds). A further 129ha of arable land is sustainably farmed by tenants (with commercial crops being grown, either as part of a government-funded agri-environment scheme option such as for spring cereals, or with elements such as grassed margins for wildlife surrounding the fields).

People: The project is providing flood protection to 348 properties, a water treatment facility and a road serving 5,000 residents. Anecdotally, this has helped to relieve the emotional stress faced by vulnerable communities. It will also help to relieve economic pressures such as those associated with maintaining the previous shingle bank. The overall estimated benefits are £90 million compared with project cost of £28 million.⁸²

Medmerry Nature Reserve is within walking distance of the town of Selsey and has an extensive network of

public footpaths, cycle paths, and free car parks. Local people are using this new, easily accessible green space to exercise and socialise and collectively help manage the reserve, which all help improve their health and mental well-being⁸³. The project has also helped to attract green tourism; based on the use of the car parks alone, it is estimated that there are at least 30,000 visitors a year.

Local farmers can get higher prices for the beef produced from the cattle that graze the salt marsh grasses on site, given that the beef has a higher percentage of salt, which is favoured by consumers.

Medmerry is now part of the English school curriculum as an example of coastal management and climate change adaptation. It is included in RSPB's schools programme, helping to educate children from all backgrounds about the importance of working with nature to help tackle climate change challenges.

The project has received over 16 major national and international awards for engineering, environmental enhancement and community engagement. A highlight was winning the prestigious Prime Minister's Better Public Building Award in 2014, where the scheme was described by the panel as "ground-breaking" and "innovative."⁸⁴

Success factors

Working closely with local residents: The Medmerry Stakeholders Advisory Group included representatives of a wide range of community interests, from residents' groups and local authorities to tourism providers, access groups, farmers, business owners and environmental groups. This helped to allay concerns about the flood risks to homes and businesses

Close collaboration between the government, private and civil society: This ensured that the right players were involved to create a transformative large-scale nature-based solution, especially in terms of funding and supportive policies.

Long-term planning: This project was identified through an opportunity-mapping exercise more than ten years before the work was carried out. Rigorous strategy design processes, plan development, community engagement and implementation ensured that the project was well thought out and had good levels of support across relevant parties prior to implementation.

Scientific underpinning: This project involved detailed, systematic scientific studies to ensure the best benefits for people, property and wildlife. Lessons were learned from the failure of the defences used in the past.

Resources

Rosie Miles and Nathan Richardson (2018). **Sustainable Shores Technical Report**. RSPB

IUCN (2020). **'Case study: Demonstrating biodiversity gains: Large-scale coastal re-alignment using NbS can (re)create biodiversity habitats'** in Global Standard for Nature-based Solutions. A user-friendly framework for the verification, design and scaling up of NbS. Gland, Switzerland: IUCN.

RSPB (2021) **Harnessing the power of nature to tackle climate change: 5 lessons based on what works**. RSPB

Web page: **Environment Agency page about Medmerry**

Web page: **RSPB page about Medmerry**

Medmerry is an example in the England National Curriculum for geography; web pages:

Geographical Association: Managed realignment & BBC Bitesize Managing our Coastlines

Video: **Medmerry managed realignment scheme**

82 <https://environmentagency.blog.gov.uk/2016/10/17/building-a-greener-future/>

83 <https://www.nature.com/articles/s41598-019-44097-3>

84 <https://www.gov.uk/government/news/prime-ministers-better-public-building-award-2014>

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3. NbS to address the triple emergency: Key success factors

The case studies in Section 2 highlight ‘success factors’ that could help NbS successfully contribute to protecting nature, tackling climate change and supporting local peoples’ well-being. They are briefly discussed below.

Integrated approaches that protect, restore and sustainably work with nature

All the case studies combine protection, restoration and sustainable harnessing of nature to achieve multiple objectives. For example: in Cambodia, a project combined sustainable farming practices with conserving natural habitats around the farms; in Pakistan and Kenya, mangrove restoration was combined with sustainable fishery and livestock farming; in Kenya, sand dams were combined with sustainable farming and land restoration; and in the UK coastal habitat restoration ran alongside sustainable cattle grazing.

These integrated approaches can, in many cases, make local communities more resilient to climate change, sequester carbon, enhance biodiversity and also ensure local communities can enjoy the economic, social and

environmental benefits provided by healthy nature. Simply focusing on climate or nature without considering local communities’ livelihoods and needs risks causing harm, undermining access to or availability of key livelihood resources, causing maladaptation, and exacerbating existing inequalities, poverty, marginalisation and conflict. Similarly, development or climate solutions that do not protect, restore and sustainably work with nature will probably fail in the long term as over-stressed nature becomes less able to offer valuable natural resources and crucial ecosystem services (for example water supplies, crop pollination, and natural defences against drought, floods and landslides) that people depend on.

Landscape approaches that build on long-term multi-stakeholder partnerships

Landscape-wide approaches work best. Whether implemented within a 17-hectare coastal zone in Kenya or an entire nine-million-hectare mountainous eco-region in Ethiopia, successful NbS take account of the complex interrelationships between land and watercourses, forests and farms, fresh and marine waters, urban and rural settings, or highland and lowland environments. Integrated landscape approaches acknowledge that an ecosystem contains living and non-living elements that interact together, and that NbS must work with those complex interrelationships to be effective and create resilience within the system. A landscape approach also brings together stakeholders across different sectors (and, in the case of the Greater Gola Landscape, across countries) to discuss and form partnerships. This helps manage trade-offs and address the multifaceted and deep-rooted problems of environmental degradation, poverty, inequality and climate change.

Multi-stakeholder partnerships of communities, researchers, NGOs, governments and the private sector can also make sure research, policy and financing

expertise as well as actual project implementation draw on complementary skills and knowledge. Cooperation is critical for ensuring long-term positive outcomes for climate, nature and people. For example, the WWF-supported mangrove restoration initiative in Pakistan highlighted how very strong collaboration between the forest department, coastal development authority and IUCN ensured a coordinated approach to mangrove rehabilitation and created synergies. Similarly, the Gola Rainforest Conservation Partnership in Sierra Leone brings together representatives from the Sierra Leone national government, local and international conservation organisations and paramount chiefs from local communities. They exchange perspectives and expertise and jointly make decisions on how to implement NbS in the region. Meanwhile, in the Bale Mountains of Ethiopia, experiences show that multi-sectoral and multi-agency approaches can be effective in addressing the multifaceted and deep-rooted problems of deforestation, degradation, food insecurity and poverty.

Long-term engagements and planning that combine science with local and traditional knowledge

Many successful case studies involve long-term investments and more than a decade of continuous work in the same region. This allows long-term planning for NbS and an adaptive approach that ‘learns from doing’.

For example, RSPB has worked with local communities in the Greater Gola landscape in Sierra Leone for decades, as have Farm Africa in the Bale Eco-region of Ethiopia, and World Vision in the Humbo District of Ethiopia. Such

long-term engagement helps build trust among all stakeholders, including local communities. It ensures intervention designs are tailored to the unique local socio-economic and political circumstances and to addressing the drivers of negative impacts locally. Through long-term engagement, local communities, implementing organisations and scientists can collaborate to devise NbS that combine local, traditional knowledge with long-term

data and research. The case study from China shows how scientists and communities have worked together to improve traditional watershed management and seed-breeding techniques to better adapt to climate change. In Peru, data from community mapping of flood-prone areas and evacuation routes was combined with monitoring systems to create an early warning system for floods.

Participatory approaches that ensure strong community ownership

All the case studies emphasise that strong local community leadership for NbS is ‘make-or-break’ for success. Participatory approaches were used throughout the design, implementation, and monitoring of the projects to encourage community ownership. In Excellent Development’s Kenya project, African Sand Dam Foundation works via already established local ‘self-help groups’ within the community rather than by creating new project structures. This ensures the intervention is part of community life and the structures over which they have agency and control. Many case study projects also sought to work through — and in doing so, strengthen — existing community-based organisations and governance structures, or establish and support the development of new ones where they did not already exist. These facilitate collective decision making and foster collective actions. In Mali, local communities were supported to

take on stewardship of communal forests via a forest dialogue group and a steering committee. These bodies involved all local stakeholders and provided open forums for discussions and space to address conflicts and adopt joint plans. In Sudan, the participatory process of mapping natural resources, developing catchment management plans and demarcating migratory routes helped to revive the broken but historically symbiotic relationship between pastoralists and farmers.

Putting communities at the heart of all these projects ensured that what was implemented actually worked in the local context, and that benefits were accrued to local people. Bringing public authorities into community engagement processes can also deliver benefits and strengthen relationships.

Combining short-term and long-term benefits that are secured through sustainable finance strategies

Some benefits from NbS may take a long time to materialise, especially where nature has been severely degraded and/or is suffering from severe climate change impacts. For example, agroforestry practices may take years to restore degraded soil and deliver more crops for local farmers. Restoring overgrazed highland meadows or forests on slopes, so that they retain more water and suffer fewer landslides, may necessitate long-term limitations on their use, especially if drought and wildfires slow restoration. To address this challenge, many organisations in the case studies have adopted strategies that seek both short-term and long-term benefits for local and poor communities. In World Vision’s initiative in Ethiopia and Tree Aid’s initiative in Mali, for example, communities can prune trees to get fodder and firewood and enjoy non-timber forest products (NTFPs) like honey in the short term. In the longer term, forests on communally owned land regenerate to provide incomes from carbon storage and also help protect communities from landslides and soil erosion. In Peru, dams are combined with native vegetation restoration and sustainable use of natural resources in key watersheds. This helps ensure long-

term sustainable management of water resources while meeting immediate needs for irrigation, fishing, and energy generation. Similarly, in Kenya, Excellent Development has implemented dams that build up sand in ephemeral rivers, massively boosting local water storage capacity. This type of hybrid management can also balance many sectors’ water needs and gain broad stakeholder support for NbS.

Many case studies included activities that offered support to local small businesses. These can help sustain economic benefits in the long term. In Cambodia, local farmers get training on growing organic rice. They organise into village networks and are offered a premium price and secure access to markets when they commit to conserving forests around their land. In Mali, community-led small businesses have formed to sustainably produce and sell NTFPs like shea and honey. These small businesses support each other to increase product volume and combine their negotiating power, achieving better prices for all their members. Improved income from NTFPs then provides communities with incentives to protect and sustainably use their forests.

Developing enabling policies that can drive systemic changes on a large scale

The case studies demonstrate the importance of working closely with local, regional and/or national governments. These relationships ensure long-term enabling policies are put in place, or generate funding that can help drive systemic changes and support NbS implementation at a large scale. For example, in Kenya, a community-based mangrove restoration initiative supported by Plan International currently covers 17 hectares. Close collaboration with local and county governments means

the lessons learned can inform regional plans and national policies, helping to scale up approaches elsewhere. The Farm Africa eco-regional approach in Ethiopia is now being scaled up to the entire region and has a focus on integration with government planning. It has also contributed to the Government of Ethiopia's development of national policies for participatory forest management and support for REDD+ implementation.

Action on gender equality

Ensuring meaningful participation and leadership by women is crucial to success. The case studies suggest that activities that tackle gender inequality are a fundamental building block for successful NbS. In many developing countries, women are important natural resource managers. For example, the case studies from Peru, Kenya and Mali highlight how women are predominantly responsible for providing water, fuel and food for their families and communities, and are likely to use improved earnings to invest in the long-term well-being of their households and wider communities. Women have first-hand experience of addressing natural resource distribution issues and long-term risks as they plan for the future of their families, while at the same time they possess much of the local knowledge and skills vital to addressing these challenges. Their long-term perspectives can contribute to better monitoring of risks and outcomes.

However, women often face barriers when accessing land, credit and decision-making processes. This makes them more vulnerable to both biodiversity loss and climate change. Improving gender equality, and increasing women's participation/prominence in communal decision-making and leadership roles and in local governance structures, will ensure that NbS effectively respond to the needs of women and girls. Women's equal participation at every level is crucial for NbS to deliver positive long-term outcomes for entire communities.

4. Recommendations

The case studies and analysis of success factors lead us to seven recommendations for harnessing NbS.

- 1. Support local communities to champion NbS:** Healthy ecosystems provide livelihoods for Indigenous Peoples and local communities, and are at the heart of many of their cultural and spiritual beliefs. Nature is their first — and often only — defence system against climate changes and extreme weather events. Their traditional knowledge is indispensable to successful NbS. All the case studies highlight the importance of actions to support local communities. Governments should uphold IPLC rights, especially land tenure rights; prioritise funding for NbS that is locally-led; provide policies that support communities to lead, participate in and support NbS; and provide funding and support for community-based organisations that can ensure long-term community involvement.
- 2. Include strict safeguards and standards to avoid unintentional negative impacts or greenwashing:** NbS should benefit climate, nature and people, and should not be used to mask business-as-usual approaches. Clear safeguards should guarantee nature-positive outcomes, action on climate change, and the involvement of IPLCs. NbS must uphold IPLCs' rights, be informed by IPLCs and be delivered by IPLCs wherever possible. NbS should work with IPLC groups to implement activities on their land once consent is given and governance and decision-making arrangements are established. NbS should also adhere to existing standards and guidelines, such as the four widely endorsed NbS Guidelines developed by the Nature-based Solutions Initiative⁸⁵ and IUCN's Global Standard for Nature-based Solutions.⁸⁶
- 3. Shift to a systemic approach addressing the pressures of unsustainable production and consumption:** Even scaled-up NbS will fail to have significant impacts unless unsustainable production and consumption are also addressed, especially in the food and agricultural sectors. For NbS to provide successful, sustainable responses to the nature, climate and poverty emergencies, it is critical to eliminate systemic barriers (such as unsustainable supply chains, harmful agricultural subsidies and a lack of finance) and also provide an enabling environment (through funding, markets and good governance).
- 4. Increase long-term funding for NbS, both in quantity and quality:** Experiences and evidence from all case studies clearly show that well-executed NbS can address the triple emergencies of climate, nature degradation and rising poverty and inequality. But despite supportive political rhetoric, NbS receive only a small share of global climate finance.⁸⁷ Furthermore, the world needs to invest US\$589–824 billion extra per year if we are to reverse the devastating decline in nature by 2030.⁸⁸ We need increased overseas development finance and private sector finance for NbS. The quality of funding is also key. Emerging commitments to scale up finance for NbS should put in place plans for large-scale, long-term change and help to finance the transition to sustainable, productive landscapes. We need to shift financial flows away from activities that destroy natural habitats and repurpose harmful subsidies so that they instead support NbS.
- 5. Prioritise multi-purpose NbS at landscape scale and with a long-term vision:** All the case studies show that NbS need landscape/seascape multi-purpose planning and management if they are to deliver large-scale and game-changing benefits for people, nature and climate. NbS that have a narrow purpose and focus only on one type of land use can do more harm than good. Funding for NbS should prioritise interventions at the landscape scale that deliver benefits for different communities and marginalised people within those communities.
- 6. Facilitate multi-stakeholder partnerships to implement NbS:** Different stakeholders, including local communities, government, private sector and civil society organisations need to be involved and work together to design and implement NbS. Governments can facilitate and invest in cross-sectoral collaborations and enable interdisciplinary research that goes beyond siloed thinking and sectoral boundaries.
- 7. Integrate NbS as part of the post-COVID-19 recovery:** We need both governments and the private sector to invest more money in smarter ways so that nature can drive a green and fair economy. NbS can help make local people more resilient to crises such as COVID-19. They can also protect habitats and reduce the risk of diseases emerging in the first place. NbS that work for people, nature and climate should be prioritised in governments' COVID-19 recovery plans and stimulus packages — as highlighted in the Leaders' Pledge for Nature.⁸⁹

⁸⁵ The four NbS principles (<https://nbsguidelines.info/>) were originally developed in February 2020 as a letter from 20 organisations to the President of the UN Framework Convention on Climate Change (UNFCCC) COP26, then adopted by the Together With Nature campaign in May 2020, and refined in February 2021. Additional signatories from research, conservation, and development organisations across the globe are now being invited.

⁸⁶ The IUCN Global Standard for Nature-based Solutions lists criteria and indicators, as adopted by the Council's 98th meeting (in 2020).

⁸⁷ unglobalcompact.org/take-action/events/climate-action-summit-2019/nature-based-solutions

⁸⁸ <https://www.paulsoninstitute.org/key-initiatives/financing-nature-report/>

⁸⁹ <https://www.leaderspledgefornature.org/>

