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do nature-based interventions deliver local development outcomes?



International Institute for Environment and Development



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Fishermen cast their nets at sunrise in mangrove wetlands, Guinea Bissau. Traditional livelihoods in this region are being negatively impacted by ecosystem destruction from climate change and human activity.

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INVESTING IN NATURE FOR DEVELOPMENT:

do nature-based interventions deliver local development outcomes?





This report was compiled in collaboration with the Nature-Based Solutions Initiative (NbSI) at the University of Oxford.

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PREFACE

The destruction of nature almost certainly played a big role in the genesis of the COVID-19 pandemic. As environments where people and nature have thrived together for centuries are degraded and diminished by new and destructive forms of exploitation, human society is brought increasingly into contact with dangerous new pathogens that are rife in the diminished worlds that result from this destructive dynamic.

We need, therefore, to put the protection and restoration of nature at the heart of the healing and recovery of human society from the ravages of the pandemic.

Investing in nature for development shows us how interventions that protect, manage, restore, create and harness nature can deliver a wide range of human development outcomes for local people in poor countries. And this gives us powerful insights into how nature can also contribute to COVID-19 recovery plans. The conceptual framework for this analysis highlights both the long-term contributions nature makes to people and the immediate contributions made by involving communities in implementing nature-based interventions. And this resonates well with reviews of stimulus and recovery spending, which indicate a compelling need to balance the shortterm delivery of assistance to those who have suffered with achieving effective long-term benefits. In 2021, we know the incredible urgency of assuring that these long-term benefits include genuinely transformational action to put the world's economies on sustainable pathways that tackle the crises of climate change, biodiversity loss and growing inequality that we face.

Investing in nature for development shows that we can work effectively with nature in a number of different ways that produce benefits for people. These benefits can hit the short-term delivery mark by providing jobs and training – as well as hitting the target of promoting green transformation by protecting, restoring and growing nature's contributions to people in multiple areas, from water supply and health to social cohesion and empowerment.

In this vital year, when the world needs to see dramatic turning points in global action at the two critically important global summits on biodiversity and climate change, I hope that this study will provide the solid evidential grounding that policy and advocacy communities need to make change happen at the scale and speed required.

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Andrew Norton

Director, International Institute for Environment and Development

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Elephants at sunset in Amboseli National Park, Kenya. The large elephant herds in the park are a big draw for nature-based tourism in the area.

EXECUTIVE SUMMARY

The Leaders' Pledge for Nature, agreed at the United Nations Biodiversity Summit in 2020, commits countries to, among other things, putting nature at the heart of national and international development strategies. It also requires the development and implementation of an ambitious and transformational post-2020 Global Biodiversity Framework (GBF), recognising it as a key instrument for achieving the Sustainable Development Goals (SDGs). But does investing in nature actually deliver development at the local level? This report provides insights into the types of direct, site-based interventions that can help or hinder the achievement of development outcomes for local people and, ultimately, the delivery of the post-2020 GBF and the SDGs.

'Nature-based solutions' (NbS) is a term used to describe interventions in nature that help address key societal challenges. Initially used to describe nature-based interventions that support climate change mitigation and/or adaptation while conserving biodiversity, the term has expanded to include other social issues including food security, water security, human health, disaster risk and social and economic development. But while NbS is a relatively new concept, nature-based interventions for biodiversity conservation and/or human development are not. Protected areas, for example, have been a cornerstone of international conservation efforts for decades. The relationship between nature-based interventions and people has a long and chequered history and much has been written about the social benefits these interventions can deliver, but also about the harms they can cause.

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To date, much of the analysis of nature-based interventions has focused on specific types of interventions (protected areas, forest management schemes and so on), or on specific types of outcomes they deliver (such as food security, jobs or income). This report, by contrast, considers a wide range of interventions and a wide range of development outcomes — positive and negative. Focusing specifically on poorer (low- and lower-middleincome) countries, it explores documented evidence that 'nature-based interventions' or 'investments in nature' (including protection, management, restoration, and harnessing nature for food production), can deliver tangible development outcomes for local people, including jobs, food security, empowerment, as well as resilience to climate change.

Specifically, it explores these key questions:

- What types of investments in nature have been described and in what kinds of ecosystems?
- 2 Who instigates and who is involved in investments in nature?
- S What kinds of development outcomes have been reported, and to whom are they delivered?
- What types of outcomes are associated with what types of interventions?
- S How are outcomes delivered? By nature itself and the goods and services it delivers, or through the process of implementing an intervention?
- 6 Do interventions deliver multiple development outcomes? And are there trade-offs – between outcomes and/or between different social groups?
- Are development outcomes enough to change local people's poverty status?
- 8 What characteristics of nature-based interventions influence development and poverty outcomes?

This is not a report about financing biodiversity. By 'investments in nature' we mean deliberate interventions that are intended to ensure the protection, sustainable use and management, enhancement or restoration of nature in situ in rural settings. Some of these involve financial investments by outside actors. Others are locally driven investments of time, labour and skills. We use a typology that builds on the International Union for Conservation of Nature (IUCN) definition of NbS and includes interventions that protect, manage or restore nature as well as those that create novel natural ecosystems – for example through afforestation; and those that harness nature to produce food - such as agroecology.

And by 'development outcomes' we mean those that contribute to local-level human development in low- and lower-middle-income countries, including food, water and energy security; local economic development (jobs and income); health; other basic needs (including education); climate change adaptation and disaster risk reduction; rights, equality and empowerment; and social cohesion and security.

We collected evidence from 70 countries but it was unbalanced — we found more from sub-Saharan Africa than other regions. Furthermore, we found more evidence on protection interventions than other categories, and more from forests than from any other type of ecosystem.

Interventions commonly have more than one 'instigator' — most commonly national governments and/or local communities (in this report, Indigenous Peoples are included in the term 'local communities'). We found that even if local communities are not the main instigator, they are often involved in decision



making, and active involvement correlates with development benefits.

Wide-ranging development outcomes have been reported. The most frequent are local economic development (jobs and income) and food security, while the least are social cohesion and security and energy security. However, beyond what development outcomes are delivered, how they are distributed locally is crucial. Yet, this was an evidence gap. Many studies simply reported that 'the community' benefited without exploring any differences within the community. For those that did provide insights into distributional effects, a common finding was that the poorest or most marginalised people were least likely to benefit - particularly those that were landless. This was not always the case, however - some interventions have clearly targeted and benefitted the most marginalised groups.

We found that all the main types of naturebased interventions had generated evidence of development outcomes but we found more evidence reported from

protection interventions than from other types. For protection, management and restoration interventions the most commonly reported *positive* outcomes were food security, local economic development and climate change adaptation. For created habitat interventions they were climate change adaptation, disaster risk reduction and local economic development. And for interventions harnessing nature for food production they were food security, local economic development and rights, equality, and empowerment. Negative outcomes were reported more commonly from protection or management interventions than other types, and the most frequent related to social cohesion and security, rights equality and empowerment, and food security.

We found that development outcomes may arise as a result of the goods and services generated by and with nature, or as a result of the implementation and management of the nature-based intervention (such as the jobs created). Or a combination of the two.



Overall, we found a wealth of evidence that investments in nature can be a 'win-win' for biodiversity and development. There is also much evidence of synergies, where different types of development outcomes strengthen each other. But we also found evidence of trade-offs: between stakeholders, between development outcomes, and between biodiversity and development objectives. And we found very little reported evidence of investments in nature resulting in a change in poverty status - although it may be that the datasets we used did not cover this issue comprehensively. For the few studies we did find, some found poverty was alleviated or reduced, but a similarly small number reported that it was exacerbated.

Overall, we found a wealth of evidence that investments in nature can be a 'win-win' for biodiversity and development

> Although it was beyond the scope of this current study to systematically investigate governance, political, institutional, macroeconomic, and other contextual factors that influence the outcomes of interventions, we did capture some intervention characteristics that appear to influence development outcomes. Specifically, we found that outcomes were more often negative where there was little or no community engagement in the intervention's design or decision-making processes. By contrast, we found that interventions that deliberately targeted poor or disadvantaged groups were less likely to report negative outcomes, but the number of studies reporting on these target-specific effects was too small to make this finding conclusive.

Our findings confirm those of previous analyses and provide a sound empirical evidence base to complement the wealth of anecdotal evidence on nature-development links. But they also highlight key remaining 'knowledge gaps' including:

- The distributional effects of naturebased interventions — who wins, who loses and which intervention processes produce equitable outcomes
- The extent to which outcomes delivered affect the poverty status of local people, and
- The comparative efficacy of nature investments, compared to conventional development interventions.

Additional issues which could be covered in future analyses, but which are beyond the scope of this review include an exploration of **how** investing in nature delivers development outcomes including which external governance, institutional, power, economic and political conditions enable or constrain that delivery. Likewise the timescales over which interventions deliver development outcomes, and synergies and trade-offs materialise.

We conclude with six key recommendations for policy and practice:

- Recognise the development opportunities offered by investing in nature and the development risks of biodiversity loss
- 2 Ensure that investments in nature are designed, implemented, and managed with full and active participation by local people, and that local power dynamics are factored in
- 3 Ensure local people's rights are recognised and respected
- 4 Ensure social safeguards are in place
- Support upscaling of well-designed investments in nature that generate benefits for people and nature
- Implement the commitments in the Leaders' Pledge for Nature.

In Indonesia, women routinely weave purun (a kind of grass) to become a souvenir and sell to tourists.

1. BACKGROUND NATURE AND DEVELOPMENT

Key messages

- COVID-19 stopped 2020 being a 'super year' for nature, postponing many international meetings. However, building back from COVID-19 also offers a potential turning point for people and planet.
- The UN Biodiversity Summit was one of the few meetings not postponed, and produced the Leaders' Pledge for Nature, committing countries to putting nature at the heart of strategies to recover from COVID-19 and to advance national and international development.
- Developing countries have witnessed a long history of investments and interventions in nature, but conservation and development in these countries have not always seemed to share mutual interests.
- 'Nature-based solutions' (NbS) is a term used to describe interventions intended to benefit people by protecting, managing or restoring nature. Although originally envisaged as providing 'solutions' to climate change challenges, the term is increasingly used to describe how investments in nature can deliver other developmental priorities including food security, water security, human health, and social and economic development.

do nature-based interventions deliver local development outcomes?

2020: NOT THE PLANNED 'SUPER YEAR' FOR NATURE, BUT PERHAPS PIVOTAL?

2020 was a year of planned international summits. It was supposed to be a 'super year' for nature: when leaders recognised the impending planetary emergency, and the links between biodiversity, climate change and sustainable development. Many organisations had been highlighting biodiversity loss for years. However, the 2019 Intergovernmental Science Policy Platform on Biodiversity and Ecosystem Services (IPBES) global assessment report, coupled with "a perfect storm of environmental awareness" (Nature, 2019) had finally broken through: not just by gaining public and political attention, but also in framing biodiversity loss as a crisis as significant as climate change (Watson, 2020). The World Economic Forum in January 2020 named biodiversity loss as one of the five biggest threats to the world's economies, in terms of both likelihood and impact (🔁 WEF, 2020). Meanwhile, the UN Environment Programme described 2020 as "a make or break year ... for environmental action in the decade ahead".1

Indeed, 2020 marked the end of the United Nations Decade on Biodiversity² — during which the nearly 200 parties to the UN Convention on Biological Diversity (CBD) were supposed to have achieved 20 critical targets, agreed in Aichi, Japan, in 2010. None of these had been met in full, and biodiversity was still declining at an unprecedented rate, while facing intensifying pressures (SCBD, 2020). The WWF's 2020 Living Planet Report confirmed this finding, highlighting an average 68% decline in wildlife populations between 1970 and 2016 (up from the 60% decline between 1970 and 2014 documented in the 2018 report) (WWF, 2020).

And then COVID-19 put a halt to most international summits and their decision making.

COVID-19's exact origins are still unconfirmed, but it seems the virus probably came from bats. Although its transmission route to humans is unclear (IUCN, 2021), COVID-19 has forced people to recognise that a wide variety of wildlife diseases are more likely to 'jump' into humans and their livestock when there is close contact. That close contact can arise from hunting, trading and eating wildlife, especially where wild species lose their habitat because of deforestation and land conversion for agriculture (Rohr et al., 2019; Allen et al., 2017; Jones et al., 2008). In other words, disease emergence and biodiversity loss share many driving forces.

One event that did go ahead in 2020 was the UN Biodiversity Summit 2020. It produced a high-level 'Leaders' Pledge for Nature', signed by 64 countries (and more since the event).³ The Pledge, developed with the pandemic as a backdrop, recognises the broken relationship between people and nature. And it commits countries to tackling biodiversity loss, ensuring the rights of Indigenous Peoples and local communities (IPLCs) and putting nature at the heart of development. Crucially, the Pledge picks up a key theme of the IPBES Global Assessment report in noting "A transformative change is needed: we cannot simply carry on as before." So, despite, or perhaps partly because of, the pandemic, 2020 may still turn out to have been a pivotal moment for reflection on people's relationship with nature.

The Leaders' Pledge for Nature also commits countries to developing and implementing an ambitious and transformational post-2020 Global Biodiversity Framework (GBF),

3 Zwww.leaderspledgefornature.org/

^{1 🔀} www.unenvironment.org/news-and-stories/story/2020-crunch-year-biodiversity-and-climate-emergencies

^{2 🔁} www.cbd.int/2011-2020/

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BOX 1. Nature's developmental benefits: illustrative facts and figures

- Homes: over 800 million people live in tropical forests and savannahs in developing countries (FAO & UNEP, 2020).
- Food: grassland ecosystems provide grazing lands for livestock that supports millions of people, especially poor, marginalised groups (Coppock et al., 2017; Parr et al., 2014).
- Jobs: forests provide more than 86 million green jobs and support livelihoods for many more people (FAO & UNEP, 2020).
- Income: forest products provide around 20% of income for rural households in developing countries (Angelsen et al., 2014).
- Health: traditional (wild plant and animal) medicine provides primary health care for up to 85% of the population in some African countries (Antwi-Baffour et al., 2014). Globally, fish provided more than 3.3 billion people with 20% of their average per capita intake of animal proteins, reaching 50% in some countries (FAO, 2020).
- Livelihoods: 116 million people work in capture fisheries in developing countries. Of these, more than 90% work in small-scale fisheries, with women making up almost 50% of the workforce (World Bank, 2012).
- Wealth: in low-income countries, natural capital is the most important component of national wealth at 47% in 2014 (Lange et al., 2018).

recognising it as a key instrument for achieving the Sustainable Development Goals (SDGs). The draft GBF explicitly recognises nature's contributions to people — particularly the poorest and most vulnerable. One GBF target, for example, highlights the need to "ensure benefits from biodiversity, such as improved nutrition, food security, livelihoods, health and wellbeing". Other GBF targets specifically recognise the potential of "nature-based solutions and ecosystem-based approaches" for climate change mitigation, adaption and disaster risk reduction; and they highlight the importance of conservation and sustainable management in agricultural and other managed ecosystems.⁴ Our report provides insights into the types of direct, site-based interventions that can help achieve these targets and, in so doing, contribute to delivery of both the GBF and the SDGs.

We are still near the 'tipping point', an irreversible loss in the vital services nature provides. The pandemic could undermine action on climate and biodiversity crises, in a rush to 'build back' at any cost. However, if the Leader's Pledge is implemented, in synergy with the UNFCCC, the CBD, and the SDGs, then perhaps the balance will shift in the right direction.

12 NATURE AND DEVELOPMENT: WHAT'S THE CONNECTION?



Nature produces and delivers a wide range of benefits upon which humans depend — from breathable air and clean water, to fertile soil and food. Biodiversity loss undermines ecosystems' abilities to function effectively and efficiently, thus undermining nature's ability to provide us with a healthy environment (Cardinale et al., 2012). This loss of resilience is particularly important in a changing climate (Isbell et al., 2015).

Although biodiversity loss is still often framed as an environmental problem, there is increasing recognition (especially in the light of COVID-19) of its severe implications for development — both in terms of the fates of individuals and in terms of achieving national

⁴ At the time of writing the GBF is still being negotiated. Wording of targets may therefore change. The current text is available at: 2 www.cbd.int/conferences/post2020/post2020-prep-01/documents

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Figure 1. **Biodiversity and the SDGs** BIODIVERSITY BIODIVERSITY SDG CONTRIBUTES LOSS IS A THREAT **TO GOAL TO GOAL** \rightarrow Ň*ŧŧ*Ĭ 3 GOOD HEALTH ∕∿/` Ø ١ 0 8 DECENT WORK 1 13 CLIMATE -R \rightarrow = direct contribution, \rightarrow = indirect. Note: figure adapted from SCBD (2020).

and international development goals, including the SDGs — see Figure 1. Biodiversity loss increases risks of zoonotic diseases like COVID-19, but it also escalates threats to food security, water security, climate change adaptation, disaster risk, and pollution control, while at the same time reducing options for future innovation (Roe et al., 2019).

Any loss, degradation or relocation of biodiversity can impinge on human wellbeing, but it particularly disadvantages poor and marginalised people who often a) depend more directly on natural resources and services for their immediate livelihood needs (Box 1), and b) cannot afford substitutes for previously free natural resources and services (Roe et al., 2019).

B INVESTMENTS IN NATURE: A CHEQUERED RELATIONSHIP WITH PEOPLE

Because poor people often depend directly on nature for their day-to-day livelihoods, especially in rural areas it seems logical to assume that, if nature is conserved and well-managed, it can continue to support such livelihoods, act as safety net to prevent people falling into poverty and even in some cases act as a route out of poverty. However, conservation interventions have a long and chequered relationship with poorer communities, particularly in the context of wildlife conservation and protected areas. The term 'conservation' is generally understood to mean the protection, maintenance and restoration of nature (eg SCB, 2005). However, the way in which nature is conserved and managed varies hugely, from strict preservation to allowing commercial consumptive use. There is much debate about the relative merits and effectiveness of these different approaches and their implications for local people and for poverty alleviation. Mace (2014) characterises the history of conservation into four phases:

- **1960s and 1970s: 'nature for itself'**, with an emphasis on wilderness and intact natural habitats, generally without people.
- 2 1980s and 1990s: 'nature despite people', which focused on threats to nature from humans and strategies to address these.
- 2000s: 'nature for people', which switched attention from species to ecosystems and recognised the benefits these provide through ecosystem goods and services.
- 2010 onwards: 'people and nature', which recognises the two-way, dynamic relationships between people and nature and the interconnectedness and complexity of socioecological systems.

Similarly, the way the development sector has viewed and treated nature can be characterised into four phases (Bass, 2019):

- From 1950s: development by converting nature, including various land and natural resource (particularly forest) development schemes.
- From 1990s: development 'doing no harm' to nature, characterised by the introduction of environmental impact assessments for development

interventions, with measures to mitigate detrimental impacts.

- S From 2000s: nature co-benefits from development, bringing increased attention to sustainable land and natural resources management as a key element of sustainable livelihoods. The Millennium Development Goals (MDGs) included a goal to "ensure environmental sustainability", recognising nature's contribution to development and therefore the need to conserve it.
- From 2010: development with nature, as epitomised by the 17 interconnected SDGs, and increased attention to social-ecological resilient systems, natural capital and planetary boundaries thinking.

Both characterisations reflect a trend towards integration between conservation and development. However, in both sectors, examples from each phase still exist today.

It is worth briefly highlighting some of the key types of nature-based interventions that have aroused debate through these phases. The first, and most prominent, is protected areas, a strong feature of the first two phases in Mace's typology. In the late 19th Century, American naturalists Gifford Pinchot and John Muir were bitterly divided as to whether nature should be used for economic gain, or strictly

<image>

protected from human interference (Miller, 1998). By the 1950s a polarised debate about conservation's purpose, and whether to establish national parks to protect species, or to benefit people, had begun to emerge (Holdgate, 1999). Since the 1980s there has been intense debate about the human impacts of protected areas (as well as their conservation effectiveness), particularly in terms of their impacts on human rights, resource rights and land rights. Various studies have documented how protected areas can reduce poverty and improve wellbeing (eg Andam et al., 2010; Naidoo et al., 2018) while others have highlighted evictions, reduced access to critical livelihood resources and human rights abuses (eg Brockington & Igoe, 2006; Brockington & Wilkie, 2015; Tauli-Corpuz et al., 2020).

Similar debates have taken place over other forms of nature interventions, including reduced emissions from deforestation (REDD+) projects (eg Griffiths, 2007; Beymer-Farris & Bassett, 2011); payments for ecosystem services schemes (eg Menton & Bennett, 2018); nature-based tourism and other enterprise-based approaches (eg Brockington & Duffy, 2011); integrated conservation and development projects (eg McShane & Wells, 2004) and alternative livelihoods interventions (eg Wright et al., 2015). For nearly all types of interventions, some analyses document benefits and others document problems, demonstrating that it is usually not the specific type of intervention that determines its social outcomes, but rather how it is designed, implemented and managed. The extent to which an intervention responds to marginalised people's rights and interests, recognises power imbalances and the consequent unfair distribution of costs and benefits, and actively encourages participation and inclusivity are particularly important (Roe et al., 2013).

A NEW NARRATIVE

The term nature-based solutions (NbS) was first coined in a 2008 review of the World Bank's biodiversity portfolio and contributions to climate change mitigation and adaptation (MacKinnon et al., 2008). Reducing emissions from deforestation and forest degradation (REDD) - initially referred to as 'avoided deforestation' – had been highlighted as a potential 'nature-based response' to greenhouse gas emissions at the 11th UNFCCC Conference of the Parties (COP11) in 2005. In 2009, REDD evolved into REDD+, when various countries, NGOs and private companies successfully argued for it to include conservation, sustainable management of forests, and enhancement of forest carbon stocks. The potential for trade-offs between REDD+ activities and biodiversity, and between REDD+ activities and local people, was recognised early on and a series of environmental and social safeguards were drafted at COP15 in 2009 and adopted at COP16 in 2010 (Swan et al., 2011).

As REDD+ was gaining prominence as a mitigation approach, ecosystem-based approaches to adaptation (EbA) were also gaining recognition. The CBD defines EbA as "the use of biodiversity and ecosystem services to help people adapt to the adverse effects of climate change" (SCBD, 2009). This definition was elaborated upon by the CBD COP10 decision on climate change and biodiversity (Decision X/33) to include "sustainable management, conservation and restoration of ecosystems, as part of an overall adaptation strategy that takes into account the multiple social, economic and cultural co-benefits for local communities".

Interest in EbA arose from a recognition that the poorest people were likely to be hardest hit by climate change as well as being the most directly dependent on healthy ecosystems for



their day-to-day livelihoods. For centuries, if not millennia, such communities have innovated and instigated practical and effective nature-based solutions to external change. Indeed, many interventions have not necessarily been labelled as EbA and NbS because they were documented well before the terms arose. Examples include ecosystem restoration, soil and water conservation, agroecology and ecosystem-based disaster risk reduction (Doswald et al., 2014).

Following the World Bank publication in 2008, IUCN developed a position paper for the UNFCCC COP in 2009 highlighting the importance of biodiversity for mitigation and adaptation (IUCN, 2009). The IUCN paper used the term NbS as an umbrella concept within which REDD+ was a naturebased mitigation approach and EbA a nature-based adaptation approach. Since then NbS has become a mainstream term: both the IPBES Global Assessment and the IPCC Climate Change and Land Report highlight the importance of NbS. The Global Adaptation Commission and UN Climate Action Summit have a specific action track for NbS, and over two thirds of signatories to the UNFCCC's Paris Agreement include NbS in their climate change mitigation and/or adaptation strategies.⁵

Within the climate change arena, EbA remains the key nature-based approach for adaptation. NbS for mitigation now includes conservation, restoration and improved management of soil, wetlands, grasslands, agricultural lands and coastal zones, as well as of forests (Griscom et al., 2017).

Although NbS is rooted in climate change mitigation and adaptation, the concept has also been applied to other societal challenges including food security, water security, human health, disaster risk, and social and economic development (Seddon et al., 2021). IUCN now defines NbS 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" (Cohen-Sacham et al., 2016). NbS therefore fits well in Phase 4 of both Mace's conservation typology – people and nature, and Bass's development typology development with nature.

⁵ See Seddon, Daniels et al. (2020) for a detailed overview of the emergence of NbS as a key policy priority globally

Seed planting during an enviromental awareness lesson, the Democratic <u>Republic of Congo</u>.

FOR, AND SCOPE OF, THIS REPORT

Key messages

- Nature's contribution to human wellbeing and development has been the focus
 of numerous global reviews, but there have been relatively few assessments of
 how actively intervening or 'investing' in nature delivers development outcomes
 for local people.
- This report helps fill that gap. Our review, which provides important insights, examined over 400 studies published in the past decade that have described nature-based interventions and their human development outcomes.
- Nature-based interventions, or 'investments in nature' include interventions protecting, managing or restoring nature, creating new habitats, or harnessing nature and its benefits for food production.
- Local-level development outcomes include: food security; water security; energy security; local economic development (jobs and income); health; other basic needs (including education); climate change adaptation and disaster risk reduction; rights; equality and empowerment; and social cohesion and security.
- While there is a large body of literature on nature-based interventions, much practical local experience is undocumented. This review is limited by what has been studied and recorded and by the comprehensiveness of the bodies of evidence we used, but nevertheless provides important insights that could be complemented by future studies.

INVESTING IN NATURE FOR DEVELOPMENT:

do nature-based interventions deliver local development outcomes?

ABOUT THIS **REPORT: OVERVIEW OF SCOPE AND** METHODS

This report explores the documented evidence that nature-based interventions, or investments in nature – including protection, management, restoration, creation and harnessing nature for food production – can deliver tangible development outcomes. Those might include jobs, food security, empowerment and climate change resilience for local people in poor (low- and lower-middle-income) countries. See Figure 2 for a conceptual framework. We were interested to understand:

What types of investments in nature have been described and in what kinds of ecosystems?

- 2 Who instigates and who is involved in investments in nature?
- B What kinds of development outcomes have been reported, and to whom are they delivered?
- 4 What types of outcomes are associated with what types of interventions?
- **5** How are outcomes delivered? By nature itself, or through the process of implementing an intervention?
- 6 Do interventions deliver multiple development outcomes? And are there trade-offs - between outcomes and/or between social groups?
- Are development outcomes enough to change local people's poverty status?



Figure 2. The conceptual framework for this review

The conceptual framework depicts how investing in nature - through interventions (examples in the blue outer ring) to protect, manage, restore, create or harness nature - delivers a range of development outcomes for local people. The delivery pathway may be directly from nature (green arrow) reflecting natures' contributions to people, or it may be through the implementation or rollout of the intervention (blue arrow).

8 What characteristics of nature-based interventions influence development and poverty outcomes?

This report is not a comprehensive, systematic, global assessment of the evidence base. Given the scope of the questions we were interested to explore — such an exercise would have required significant time and resources. Rather, it analyses existing datasets of studies on nature-based interventions, supplementing these with recent additional information from other peer-reviewed studies and an extensive collation of grey literature. Annex B provides details of the research methodology, but in summary:

- We started with a database of peerreviewed literature systematically collated by the Nature-based Solutions Initiative (NbSI) and used to generate an evidence map6 on NbS effectiveness for climate adaption (Chausson, Turner et al., 2020). While adaptation to climate change is a development outcome in itself, many of the interventions in the dataset reported on other aspects of local development, such as the creation of new jobs or empowerment of marginalised people. In other words, the NbSI dataset provided a comprehensive source of studies on development outcomes in the context of investments to counter climate change impacts.
- We updated the NbSI dataset to capture additional studies of nature-based solutions published after the evidence map was completed (ie post-April 2018).
- We complemented the NbSI dataset with grey literature gathered from international conservation organisations, UN agencies and CGIAR organisations, development assistance agencies, and international development

NGOs (see Research Methodology in Annex B for full details of organisational websites reviewed).

We drew on additional information from the wider peer-reviewed literature covering linkages between nature-based interventions and development, listed in the PCLG Research Digests.⁷

In all, we examined 433 studies from 70 countries and for each study we extracted data on the type and characteristics of the nature-based interventions using a coding framework. We found more evidence on nature-based interventions from sub-Saharan Africa than elsewhere (56% of the 433 studies reviewed) and more from lower-middle-income countries (60%) compared with low-income countries (40%). Nature-based interventions have not necessarily been used more often or with more success in Africa: the predominance only reflects the scope of our datasets, and what has been documented.

Constrained by time and resources, we extracted information on development outcomes from a subset of 260 interventions (drawn from the NbSI dataset and grey literature). For 164 of these we explored in detail the links between intervention types and outcomes. Section 3 sets out how many studies we base each key finding on, and Annex B provides full details of the research protocol.

Our analysis considers the key characteristics of nature-based interventions, not the external influencing factors. Recognising that implementation, governance, political and institutional factors influence the outcomes of nature-based interventions, we see this analysis as a starting point — and we make recommendations for follow-up research.

^{6 🔀} www.naturebasedsolutionsevidence.info

⁷ Nwww.povertyandconservation.info/en/pages/newsletters.

do nature-based interventions deliver local development outcomes?



2.2.1 Global reviews of nature's contributions to people

Numerous global reviews have examined nature's contributions to human wellbeing and development. WWF has published The Living Planet Report every two years since 1998, documenting our ecological footprint. The groundbreaking Millennium Ecosystem Assessment (MA), published in 2005, was the first major study to look at nature's contribution to humans, rather than human impacts on nature, and to consider the consequences of ecosystem change for human wellbeing. Building on the Millennium Ecosystem Assessment – and deliberately including Indigenous and local knowledge into the assessment - the IPBES Global Assessment report (IPBES, 2019) was the first intergovernmental assessment of the state of nature. It documented the unprecedented decline in species, genetic diversity and ecosystem integrity and the resulting challenges to human wellbeing and to achieving the SDGs.

2.2.2 Economic analyses

One of the first detailed economic analyses of biodiversity and ecosystem services was The Economics of Ecosystems and Biodiversity (TEEB) initiative⁸ which in 2010 highlighted the need to mainstream biodiversity values in both public and private decision making. And one of the latest is the Dasgupta Review of the Economics of Biodiversity (Dasgupta, 2021), which frames nature as an asset that humanity is failing to manage properly, thus undermining its contribution to our wellbeing and to the global economy. The Review doesn't seek to determine an overall economic *value* for nature's contribution to people, but rather highlights options for better managing the current imbalance between our demands on nature and its supply of benefits.

However, other global studies have sought to put an economic value on nature, however. The OECD, for example, has estimated values for various aspects of biodiversity and ecosystem services, from seagrass nutrient cycling (US\$1.9 trillion p.a.) to coral reef tourism (US\$362 billion p.a.) (OECD, 2019). Overall, it has been suggested that 55% of global GDP may depend on nature (SwissRe Institute, 2020). While some studies have estimated global values for nature, others have explored its value to poor people in particular. TEEB, for example, introduced the concept of "GDP of the poor". It highlighted the disproportionate contribution forests and other ecosystems make to poor rural livelihoods - typically 50-90% compared to their 6-17% contributions to GDP at national level (TEEB, 2010).

2.2.3 Analyses of specific elements of nature or development

Forests are one component of **nature** that have been particularly well studied in terms of their contribution to development and poverty reduction. The International Union for Forest Research Organisations (IUFRO), for example, reviewed forest contributions to poverty alleviation and the wellbeing of the poor (Miller et al., 2020). The review considered several aspects of the relationship, including how forests: 1) help households move out of poverty through income generation; 2) support wellbeing through subsistence, food security and cultural and spiritual values; and 3) mitigate risks. IUFRO concludes that while the relationship between people and forests varies with context, the most common effect is that forests help the poor to secure and stabilise their livelihoods, rather than helping them exit poverty (Miller et al., 2020). This finding reinforces ten years of

⁸ Attp://teebweb.org/

research across many ecosystems from the Ecosystem Services for Poverty Alleviation (ESPA) programme (Schreckenberg et al, 2018).

And food security is one **aspect of** development that has been well studied. For example, in addition to regularly assessing the state of the world's fisheries (the latest report being FAO, 2020), FAO conducted the first global assessment of the state of biodiversity for food and agriculture in 2019. The assessment covered many components and dimensions of biodiversity, including domesticated and wild species, genetic diversity, soil micro-organisms and pollinators. Numerous other reviews explore how other components of nature contribute

to food security including: forests (eg Vira et al., 2015; HLPE, 2017; Sunderland & O'Connor, 2020); fisheries (eg World Bank, 2012) and wild animals (eg Cawthorn & Hoffman, 2015, Coad et al., 2019). Table 1 lists recent key reviews of different aspects of nature and of development.

2.2.4 Analyses of nature-based interventions

Despite the wealth of documentation on nature's value and its contributions to people, relatively few studies have assessed how actively intervening or investing in nature supports development locally. In a review of literature published between 1985

TABLE 1.	Recent studies exploring the contribution between key components of nature and key development outcomes		
COMPONE	INT		

COMPONENT OF NATURE	ASPECT OF DEVELOPMENT	REFERENCES	
Forests	Food security	Vira et al., 2015; HLPE. 2017; Sunderland & O'Connor, 2020; FAO & UNEP, 2020	
Forests	Health	Colfer, 2008	
Forests	Poverty alleviation	Miller et al., 2020	
Forests and land	Jobs	FOLU, 2019	
Land	Food security	IPCC, 2019a	
Land	Climate adaptation	IPCC, 2019a	
Marine and coastal ecosystems	Climate adaptation	IPCC, 2019b	
Fisheries	Food security	World Bank, 2012; FAO, 2020 (and previous State of World Fisheries reports)	
Agricultural biodiversity	Food security	FAO, 2019	
Wild animals	Food security	Cawthorn & Hoffman, 2015; Coad et al., 2019	
Biodiversity	Health	WHO & CBD, 2015; IPBES, 2020	
Nature	Jobs/economic development	N4C, 2020; WWF & ILO, 2020	
Nature	Climate change adaptation	Kapos et al., 2019	



and 2010, Leisher et al. (2013) identified ten types of conservation interventions for which there was empirical evidence of poverty reduction benefits; identifying nature-based tourism and locally managed marine protected areas as generating the highest such benefits. (However, COVID-19 has highlighted how tourism can lack resilience as a local conservation and development strategy.)

Subsequently, McKinnon et al. (2016) identified over 1,000 articles documenting human wellbeing outcomes from conservation interventions. Many studies documented a connection between 'economic wellbeing' and interventions described as 'area protection', 'resource management', and 'land and water management'. However, McKinnon et al. was intended as an evidence map rather than synthesis. Nonetheless, several studies synthesise the impacts of specific types of interventions on human wellbeing/development. Examples include terrestrial protected areas (Pullin et al., 2013, Oldekop et al., 2015); marine protected areas (Mizrahi et al., 2018); community/ participatory/decentralised forest management (Bowler et al., 2012; Samii et al., 2014a; Hajjar et al., 2020); PES schemes (Samii et al., 2014b; Porras & Asquith, 2018); large-scale tree plantations (Malkamaki et al., 2018); and land restoration (UNEP IRP, 2019). These syntheses have generated useful insights - for example finding that protected areas deliver better environment and social outcomes when they are based on community engagement (Oldekop et al., 2015). But in many cases they have found that the evidence base is too thin to draw generic conclusions (MacKinnon et al., 2016), often because interactions between people and nature are complex and context-specific. The

same has been found for ecosystem-based approaches to adaptation (EbA). A recent review (Reid et al., 2019) identifies positive social benefits based on a review of 13 EbA projects. But overall, there is limited evidence of EbA approaches delivering the social cobenefits that are claimed (Emerton, 2017).

Analyses have also been conducted for interventions in **specific ecosystems** — for example Miller et al. (2020) reviewed the evidence for a number of forest-based interventions, including community forestry, protected areas, agroforestry, PES including REDD+ schemes, forest enterprises and tourism. Once again, the review found mixed and often context-specific evidence for poverty mitigation outcomes. The strongest evidence was associated with tourism, protected areas, community forestry and agroforestry.

Other assessments have also looked at **specific** outcomes from nature-based interventions. The NbSI produced a global, systematic map of the evidence base on the effectiveness of nature-based interventions for addressing the impacts of climate change and hydrometeorological hazards on people (Chausson, Turner et al., 2020). Two 'Special Reports' compiled by the Intergovernmental Panel on Climate Change: on land (IPCC, 2019a) and oceans (2019b) also review a range of nature-based interventions, primarily for outcomes relating to climate change adaptation and mitigation, but also for food security. Nature-based jobs have attracted particular attention (eg Nature4Climate, 2020). WWF and ILO (2020) highlight reforestation, ecosystem or watershed rehabilitation and restoration, management of invasive species and the use of agroecological approaches in food production as among the most labourintensive nature-based interventions. The

Food and Land Use Coalition has estimated that investment of US\$350 billion a year in sustainable food and land-use systems could create more than 120 million new jobs and US\$4.5 trillion in new business opportunities worldwide each year by 2030 (FOLU, 2019).

2.2.5 This review

This review complements the earlier studies described above. It is unique in:

- Exploring a wide range of interventions, ecosystems and development outcomes simultaneously to investigate linkages across them
- Identifying potential trade-offs between different aspects of development, or potential for multiple linked benefits
- Focusing on poor countries
- Identifying the pathways through which development outcomes are delivered by distinguishing whether outcomes were generated by supporting nature or directly through the process of implementing the intervention itself, and
- Identifying who is instigating and who is involved in nature-based interventions.

However, much practical local experience of nature-based interventions and their effectiveness in tackling the triple challenge of climate change, biodiversity loss and development remains undocumented. Therefore, we are also working with environment and development organisations to record practical experience for a future companion volume.

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2.3.1 Nature

Ducarme and Couvet (2020) point out that there is no standard definition of nature in biological literature, and that no one cites any reference when using this frequent term. For this report we use the Oxford English Dictionary definition of nature: "the phenomena of the physical world collectively, including plants, animals, the landscape, and other features and products of the earth, as opposed to humans or human creations". The terms 'nature' and 'biodiversity' are often used interchangeably but are not the same thing. The CBD defines biodiversity as "the variability among living organisms from all sources, including diversity within species, between species and of ecosystems" (United Nations, 1992). Nature has both living and non-living components. But it is often the biodiversity of the living components that determines the health and stability of the whole, and its ability to provide people with services such as clean air and water, fertile soil and carbon storage. The 2018 Living Planet Report (WWF, 2018) uses the phrase "nature underpinned by biodiversity" to describe this relationship.

2.3.2 Investments in nature/ nature-based interventions

We use the terms 'investments in nature' and 'nature-based interventions' interchangeably to refer to deliberate interventions that are intended to ensure the protection, sustainable use and management, enhancement or restoration of nature in rural settings. Such interventions may involve investments of money, time, labour, skills and knowledge from both local land and resource managers and external actors. We do not include purely extractive interventions such as mining. Our focus includes typical conservation interventions such as protected areas but also those more recently labelled as nature-based solutions (but excluding urban NbS). This review uses, and adds to, the typology of interventions developed by NbSI for the NbS evidence map previously discussed (Chausson, Turner et al., 2020). This started with the IUCN's protect-manage-restore typology but was expanded to include interventions that create novel natural ecosystems - for example through afforestation. We here add a fifth category, interventions that harness nature in order to produce food - such as agroecology.9 Box 2 describes each of these types of intervention. However, note that distinctions between the categories are blurry, and interventions often mix these categories. For example, nature may be restored or reclaimed through protection.

⁹ Our definitions are drawn from Chausson, Turner et al. (2020) with the exception of 'nature-based food production', which is based on Vignola et al. (2015). Here we use the term 'harness' for consistency with the terminology in the other categories but our "harness" category refers explicitly to nature-based food production.

BOX 2. A typology of investments in nature











 Protect. Interventions involving a "clearly defined geographical area through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values" (Dudley, 2008). This can involve marine, land, or coastal sitespecific protection, including protected areas and their management, private land conservation measures, reserves, or conservancies, areas protected by Indigenous Peoples and local communities (eg sacred sites), or locally managed marine areas with specific set-aside 'conservation zones'. Can involve protecting a natural or created habitat.

- 2. Manage. Interventions to manage nature and natural/wild resources for activities other than nature-based food production. Examples include forestry or forest management (eg for timber, for non-timber forest products or for producing other ecosystem goods and services), species management (for example for hunting, tourism, trade, or conservation). Can involve managing natural or created habitat. Excludes agricultural, fisheries and livestock management approaches, which fit under harnessing nature for food production.
- 3. Restore. Active or passive interventions that involve returning degraded, damaged or destroyed ecosystems to a pre-disturbance natural state, including their structure or function. Also includes the restoration of natural (or wild) resources such as reintroduction or species, but excludes agrobiodiversity restoration which falls under the category of harnessing for nature-based food production. 'Restoration' can be synonymous with reclamation, reforestation, rehabilitation, revegetation, and reconstruction. Restoration is variously referred to as ecological, functional, habitat, or structural.
- 4. Create. Interventions that establish novel ecosystems. These include creating a new habitat type in place of the naturally occurring one (eg afforestation of former grasslands, created wetlands, mangrove plantations and shelterbelts) or where the habitat is modified such that it does not resemble its natural ecological state (eg rehabilitating degraded land with exotic species or reforesting an area with a single species where it should be a diverse forest). We exclude created agroecosystems here since we have included these under the category of harnessing nature for food production.
- 5. Harness. Interventions that make use of ecosystem functions and services (such as nutrient cycling, soil formation, water infiltration, pollination, natural pest control) to maintain or enhance food production. Examples include agroforestry, conservation agriculture, permaculture activities, silvopasture, ecosystem-based fisheries and enhancing crop diversity using traditional crop varieties. Excludes industrial agriculture which relies on chemical inputs and/or depletes biodiversity.

2.3.3 Development outcomes

Dictionaries define 'development' as both a process and a specific state of growth or advancement. The term implies change for the better (Esteva, 1992). Meeting basic needs is fundamental to the concept of human development, which focuses on actively improving people's lives (rather than assuming economic growth will automatically benefit everyone¹⁰) and on understanding poverty's many dimensions. Human development sees freedoms and opportunities, many of which are connected to rights and enjoyment of nature, as integral to improving lives. This review draws on concepts of basic needs and human development, but also recognises the importance of climate resilience as a key development concern. We thus focus on the following local-level development outcomes:

- Food security
- Water security
- Energy security
- Local economic development (jobs and income)
- Health
- Other basic needs (including education)
- Climate change adaptation
- Disaster risk reduction
- Rights, equality and empowerment
- Social cohesion and security

While this report focuses on local development outcomes, it is important to note nature's role in *macroeconomic* development, too. In 2005, the World Bank proposed 'wealth' as a complementary indicator to gross domestic product (GDP) for monitoring sustainable development (World Bank, 2005). A country's economic development is strongly related to its national wealth. In low-income countries, natural capital turns out to be the most important component of national wealth (47% in 2014, Lange et al., 2018).

In low-income countries, natural capital turns out to be the most important component of national wealth

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Development is about managing a broad portfolio of assets: produced, human, and natural capital as well as financial capital. 'Development' does not mean simply 'liquidating gifts from nature'. Rather, it is about more efficient use of natural capital (and its sustainable management), bringing to bear other assets, together with strong institutions and policies, to make investment attractive and productive. The private sector – the major investor in development - is increasingly buying into the natural capital concept. For example, the Natural Capital Coalition¹¹ includes many hundreds of companies. And similarly, natural capital accounting is now being used in nearly 100 countries allowing them to monitor the sustainability of their progress in development.

¹⁰ Nttp://hdr.undp.org/en/humandev

¹¹ Now called the Capitals Coalition: 🔁 https://naturalcapitalcoalition.org/

Mangroves plantation as part of the reforestation project in the Bakhawan Eco-Park, Philippines, to prevent flood and storm surges.

KEY FINDINGS ()

do nature-based interventions deliver local development outcomes?

Key messages

- Evidence on development outcomes resulting from nature-based interventions is unevenly distributed, with most evidence stemming from protection interventions, and interventions in forest ecosystems.
- Interventions are often driven by more than one actor most commonly national governments and/or local communities. Even if local communities are not the main driver, they are often actively involved in decision making.
- Reported local development outcomes are wide-ranging. The most frequent are local economic development (jobs and income) and food security, while the least are health and energy security. There is more evidence for positive development outcomes than negative. Where negative outcomes are reported they are more commonly associated with protection or management interventions than with other types.
- Development outcomes may stem from benefits generated by investments in nature, or may be a direct result of implementing or managing the intervention (such as jobs created), or from a combination of the two.
- A wealth of evidence confirms that investments in nature can be a win-win for biodiversity and development. There is also much evidence suggesting links between different types of development outcomes, such as between food security and local economic development.
- There is evidence of trade-offs between stakeholders, between development outcomes, and between conservation and development objectives. However, where interventions are bad for nature they also tend to have aspects that are bad for people too.
- There is limited evidence of effects on poverty. A few studies found poverty was alleviated or reduced, but a similarly small number reported exacerbated poverty. Worsening poverty was biased towards protection interventions, but there is no overall association between type of intervention and type of outcome.
- Where communities have little or no involvement in an intervention's decision-making processes, the development outcomes are more likely to be negative.
- Outcomes are more likely to be positive when interventions are deliberately aimed at poor or marginalised groups.

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INVESTING IN NATURE: WHAT KINDS OF INVESTMENTS, AND WHAT KIND OF NATURE?

Our review found evidence for all five categories of nature-based interventions across 70 low- and lower-middle-income countries (Figure 3). The most commonly documented was protection (found in 58% of the 433 studies in our dataset). Management interventions were found in 38% of studies, harnessing interventions for nature-based food production in 32%, restoration interventions in 28%, and ecosystem creation interventions in 15%.¹² Table 2 provides examples of the types of actions we found within the broad intervention categories.

Figure 3. Relative weight of evidence for different types of intervention



12 Percentages do not add up to 100% since some studies may address multiple categories.



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Table 2. Examples of different types of nature-based interventions

ТҮРЕ	EXAMPLES OF INTERVENTIONS	SELECTED REFERENCES
1. Protect	Marine-protected areas, locally managed marine areas, and other no-take zones to increase ecosystem resilience (eg of coral reefs, kelp beds) and the fisheries these ecosystems support; also used for ecotourism.	Cinner et al., 2013; Blue Solutions, 2018; IUCN, 2018; FFI, 2017
	Terrestrial nature conservation areas such as national parks, conservancies, wildlife sanctuaries, that mostly restrict human activities within their borders except ecotourism activities (ecotourism often funds or incentivises protection).	Osano et al., 2013; Mora-Garcia et al., 2020; Kupika et al., 2019; IIED & IUCN-SULi, 2019
	Forest protection , for example against deforestation or human-induced fire hazards. These may use local or indigenous knowledge practices to maintain forest- dependent livelihoods and natural heritage.	Lunga et al., 2016; Teshome et al., 2020
	Buffer zones around water sources and dams to protect vegetation that preserves water quality and supply.	Ngwese et al., 2018 Baba & Hack, 2019
	Sacred or religious forests , protected by local communities to be used exclusively for religious or other spiritual activities.	Zafro-Calvo & Moreno- Penaranda, 2017
2. Restore	Restoration of degraded mangroves by promoting natural recruitment or active planting. The intention may be to keep pace with sea-level rise, store below-ground carbon, and provide coastal protection.	Duncan et al., 2016; Cuc, 2015.
	Participatory reforestation that restores degraded lands so as to decrease soil erosion and flooding and provide forest resources for local livelihoods.	Sears et al., 2018
	Active grass and rangeland rehabilitation through actions such as re-seeding, mulching, brush-packing, and re-introducing indigenous species. The interventions may intend to restore communal rangelands that support local livelihoods.	Kimiti et al., 2017; Cohen-Shacham et al., 2016; FAO & Agricord, 2016
3. Manage	Sustainable forestry of diverse tree stands or natural forest areas. May involve selective logging for timber production.	Wells et al., 2016; Norris et al., 2012; Sears et al., 2018
	Management of single-species tree plantations for timber production or other products (eg rubber or pulp and paper). Tree species are often exotic.	Rangan et al., 2010; Fedele et al., 2018; Feyisa et al., 2018

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ТҮРЕ	EXAMPLES OF INTERVENTIONS	SELECTED REFERENCES
	Multi-functional forest management where forests provide domestic and income-generating goods such as fuelwood, timber for building, medicinal plants, or wild honey collection. Management involves sustainable harvesting practices (eg rules for the amount and timing of resource extraction), preventing illegal activities, and forest fire management. Community-based or participatory methods are often used.	Adhikari et al., 2018; Aguilar et al., 2011; Chishakwe et al., 2012
	Harvest regulations for wild high-value species such as aromatic or medicinal plants, or rare flowers.	Indenbaum et al., 2018; CITES, 2019a
	Species protection activities including monitoring for poaching or illegal harvesting, protecting nesting sites from predation, and controlling invasive species.	FFI, 2018
	Sustainable use of wildlife including quotas or designated hunting zones.	Chishakwe et al., 2012; CITES, 2019b
a. Combining Protect with Restore	Rangeland restoration using enclosures or ex-closures to restrict human access and livestock grazing. The intention is to allow for passive natural revegetation of degraded rangelands that will sustain, provide and regulate ecosystem services.	Descheemaeker et al., 2010; Mureithi et al., 2016
	Restoration and protection of corridors between protected areas for biodiversity conservation and, in some cases, also to maintain habitats vital for local livelihoods.	Roe et al., 2017
	Payments for ecosystem services schemes where local people are paid to restore their lands to natural habitats (eg converting croplands to native forests) and to protect them from future use or conversion in order to maintain ecosystem functions such as water supplies.	Wiik et al., 2020
b. Combining Protect with Manage	Rangeland management that encompasses zones where livestock are permitted to graze and set-aside zones for wildlife tourism and/or as a bank of grasses to be opened during fodder shortages from droughts.	Russell et al., 2018; Osano et al., 2013
	Protected areas that include sustainable use of natural resources within their borders, such as within protected forests or mangroves.	Gandiwa et al., 2013
c. Combining Restore with Manage	Restoration followed by management for ecosystem service provisioning. For example, reforestation and forest management to increase timber supply.	Brown et al., 2011

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ТҮРЕ	EXAMPLES OF INTERVENTIONS	SELECTED REFERENCES
4. Create	Establishment of tree plantations using non-native species for carbon storage. For example, under the Clean Development Mechanism carbon credit schemes that pay local people to plant trees on their lands.	Aggarwal & Brockington, 2020; Edstedt & Carton, 2018
	Establishment of plantations for regulating services eg tree 'shelter belts' or woodlots surrounding crop fields or homes to protect from wind damage.	Thevs et al., 2019; Ngwese et al., 2018; Ali & Rahut, 2020
	Coastal afforestation , including mangrove plantations, for protection from storms, salt water intrusion, erosion, and to support local livelihoods.	lmam et al., 2016; Rahman et al., 2019; World Bank, 2016
	Coral or oyster reef creation for coastal protection.	Chowdhury et al., 2019
d. Combining Restore, Manage, Protect and Create	Landscape-scale initiatives with different zones for different levels of human activity. For example, REDD+ initiatives may combine restoration of degraded forest patches, protection of intact natural forest patches, and zones of controlled natural resource extraction or plantation forestry management.	Strauch et al., 2016; Lunga et al., 2016; Sapkota et al., 2019
5. Harness (for nature- based food production)	Apiculture using native bee species. Hives may be established within forests or on farms, bringing additional benefits by increasing crop pollination or deterring wildlife crop raiding.	Lowore et al., 2020
2 Contraction	Agroforestry through understorey planting of crops such as tea or coffee in native forests.	Lestari et al., 2019
	Agroforestry by planting multifunctional or indigenous tree species on croplands. This is often used as a cross-cutting strategy to enhance food production and livelihoods while rehabilitating eroded lands, combating deforestation, and/or providing habitat for biodiversity conservation.	UNEP, 2010; GIZ, 2018
	Pasture-land management including rotational grazing practices or re-seeding degraded pastures with locally adapted grass species.	Bhandari et al., 2018
	Conservation agriculture or agro-ecological practices such as increasing crop diversity, using traditional locally adapted varieties, intercropping, integrated pest management, using compost fertilisers, no-tillage, mulching and growing pollinator-promoting species.	FAO, 2017; Dung, 2017

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ТҮРЕ	EXAMPLES OF INTERVENTIONS	SELECTED REFERENCES
	Household or community gardens promoting conservation of local species or varieties that are often endangered but offer food, material, medicinal, or cultural benefits.	Ulian et al., 2016.
	Sustainable fisheries management including practices such as bans on destructive fishing gears, enforcing fishing quotas and temporary fishing bans.	Blue Solutions. 2018
e. Combining Harness with other	Ecosystem-based fisheries management that combines no-take marine protected areas with fishing zones.	FFI, 2018; UNDP, 2018
categories	Land rehabilitation using a combination of reforestation and agroforestry.	Kumar et al., 2015
	Protected areas within which some agricultural activities are included, such as protected forest areas that include community forest gardens or protected mangrove areas that integrate aquaculture of native species.	UNDP, 2016



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Figure 4.

Number of studies reporting nature-based interventions by type of ecosystem



We found more evidence on interventions in tropical and subtropical forest ecosystems (37% of the studies reviewed) compared with other ecosystems. There was very little evidence from freshwater wetlands such as peatland, ponds, and lakes (7%); from streams and rivers (riparian ecosystems) (6%); from tropical oceans (outside of the coastal zone) (3%) or from aquatic production (2%). Figure 4 summarises the distribution of nature-based interventions across ecosystem types.


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32 WHO INSTIGATES AND WHO IS INVOLVED IN INVESTMENTS IN NATURE?

Nature-based interventions are most frequently instigated by national government agencies, local communities, or local and international environment NGOs (Figure 5). In half of all the cases we reviewed, there was more than one actor involved in driving these interventions. Most (34%) involved national government but it was also common to find local communities involved (in 28% of studies), local non-governmental organisations (27%), and international conservation or environment organisations (23%). By contrast, international development organisations were involved in driving only 6% of documented interventions, while sub-national government organisations were involved in 9%, and businesses (local or national/international) in 5%.

Even where local communities were not identified as directly instigating naturebased interventions, half the reviewed studies reported a high level of community engagement in decision making. Furthermore, 39% of interventions deliberately sought to benefit poorer and/or more marginalised groups.





Number of studies

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The most commonly documented outcomes recorded were local economic development ie jobs and/or income (reported in 70% of all cases), food security (64%), climate change adaptation (49%), rights/equality/ empowerment (45%), and disaster risk reduction (36%). The least commonly documented were energy security (12%) and social cohesion and security (14%). Figure 6 shows the breakdown, highlighting that most reported outcomes were positive.

Figure 6. Development outcomes reported from 260 nature-based interventions in low and lower-middle income countries Within each category of development outcome our review recorded specific effects of naturebased interventions. Table 3 summarises the most common.



Note: mixed effect means either (1) variable effects over time or the spatial scale of the intervention, (2) variable effects between different local people, or (3) a positive impact on one aspect of the outcome, but negative on another (for example a nature-based food production intervention might make crop yields more resilient during droughts (+ve) but at the cost of an overall reduction in yield under normal climatic conditions (-ve)). 'Unclear effect' means the study did not report a clear conclusion, or it assessed effectiveness only by comparing to alternative development actions as opposed to a counterfactual 'no development intervention scenario' (eg a control or baseline).

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Table 3.	Examples of changes in development outcomes recorded after nature-based interventions

HUMAN DEVELOPMENT OUTCOMES	TYPES OF CHANGES (POSITIVE OR NEGATIVE) EXPERIENCED
Food security	 Productivity and hence food supply: Direct measures of production, eg crop yield, fodder supply, livestock production Indirect measures supporting production, eg irrigation water supply; soil fertility and moisture; pest and disease control; pollination Access to food, eg available income in order to purchase food; nutritional quality of food Availability of fuel and water for cooking Productivity or access to food under climate change or other disturbances
Water security	 Ground, soil, and surface water storage Water quality Water supply for drinking and irrigation Water security under climate change or other disturbances
Energy security	 Availability and access to fuelwood Availability and access to hydropower Availability and access to cleaner/more efficient energy (eg high efficiency stoves)
Local economic development	 Availability of jobs (eg patrolling protected areas, planting trees for restoration) Opportunities for income generation (eg from harvesting goods (wild and cultivated) such as timber, honey, crops and livestock or from initiatives such as ecotourism, PES schemes, and carbon credits)
Health	 Availability of and access to medicine and medical care (eg through income generation) Production of medicinal plants or other health products derived from natural resources Incidents of illness and disease or conditions that cause them (eg water-borne diseases, air pollution, poor nutrition)
Other basic needs	 Availability and access to other (non-food, medicinal, or energy-related) subsistence goods (eg building materials) Access to education (eg from income generation) Access to infrastructure eg roads
Climate change adaptation	 Exposure to climate impacts (eg damages from storms and floods; crop and water losses from droughts) Sensitivity to climate impacts (eg availability of alternatives to buffer against losses under climate impacts) Community adaptive capacity (eg effects on communication platforms to enable problem solving and solution sharing)

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HUMAN DEVELOPMENT OUTCOMES	TYPES OF CHANGES (POSITIVE OR NEGATIVE) EXPERIENCED
Disaster risk reduction	 Exposure and sensitivity to disasters Community adaptive capacity to respond to disasters
Rights, equality, and empowerment	 Land rights — including ownership and management rights Gender equality, income equality Power status within communities or between communities and broader society (eg through capacity building: training in new skills or establishing communication networks)
Social cohesion and security	 Incidents of conflict between authorities or other powerful stakeholders and local communities (eg over land rights) Incidents of conflict between community members (eg over natural resources) Human-wildlife conflict (including crop and livestock losses, attacks on humans, property damage) Level of theft or damage to personal assets Incidents of crime (eg poaching) Incidents of attacks or abuse

The **distribution** of social costs and benefits is as important as the kind of development outcomes. Yet, of the 260 interventions we examined, 25 did not comment on distributional effects, and although most (165) noted that local communities benefited, no further details were provided. 70 interventions did offer varying levels of insight into distributional impacts. Distributional effects were recorded between communities and more powerful actors (eg tourism operators), between men and women, between richer and poorer or more marginalised members of the community, between the landed and the landless. Where distributional impacts were discussed it was more likely that poorer or more marginalised groups would be reported to have lost out, compared to richer, more landed, or more powerful groups.

In Tanzania, for example, joint forest management interventions tended to result in richer households harvesting a greater proportion of benefits, and poorer households bearing a greater proportion of costs (Blomley et al., 2011). In Bangladesh, an incentive-based conservation programme to protect the hilsa fishery particularly disadvantaged the poorest fishers, because they often had few alternative income sources and so were disproportionately affected by fishing restrictions. Often, they felt forced to fish illegally, and struggled even further if caught and penalised (Reid et al., 2019).

In some cases, poverty or landlessness are exacerbated by gender inequalities. For example, in Kenya's Maasai Mara, 'conservancies' have been established to protect land for wildlife (by excluding livestock). Women livestock owners suffer the restrictions on land use. But it is men that own the land and who receive compensating payments (often from tourism operators) (Bedelian & Ogutu, 2017).

Distributional impacts may, however, change over time. For example, in Ethiopia, exclosures used to protect and restore degraded common grazing land made people with little or no land and no off-farm income more vulnerable to food and income insecurities. Yet over the longer term, exclosures increased livestock productivity and were said to have made fuel wood and water easier to obtain, reducing the effort women have to spend on collecting these resources (Crossland et al., 2018).

Moreover, disadvantaging the poorest people and communities is not inevitable. For example, a coastal reforestation intervention in Bangladesh was thought to be particularly beneficial to the landless poor (Rahman et al., 2019); and managing and collecting non-timber forest products in a biosphere reserve in Zimbabwe provided food relief for the most vulnerable and poor households during drought events (Kupika et al., 2019). Similarly, an ecosystem-based adaptation project in El Salvador was thought to have given women, poor and vulnerable people the most improvements in resilience and adaptive capacity (Reid et al., 2018).

Gender norms, power differentials and livelihood strategies need to be understood and accommodated within intervention designs

The data show no obvious association between characteristics of interventions and how the costs and benefits they generate are distributed, but these examples show that gender norms, power differentials and livelihood strategies need to be understood and accommodated within intervention designs, so as not to perpetuate or exacerbate local inequalities. As Haas et al. (2019) point out with reference to a PES scheme in Vietnam: "environmental policies can reinforce existing asymmetries in power and wealth if they do not consider the sociopolitical context they operate in." Tradeoffs in the delivery of development outcomes are discussed further below, and the next section highlights the need for safeguards to protect against unintended negative consequences.



Our review found evidence of development outcomes across all five broad types of naturebased interventions. However, within the subset of 164 interventions (where it was possible to link specific types of intervention with specific types of outcome), we found more evidence reported from protection interventions than from other types.

The development outcomes most frequently reported from protection interventions were related to food security, local economic development, climate change adaptation and disaster risk reduction (DRR). From management interventions, the most frequently reported were adaptation, local economic development, food security and DRR. Restoration interventions generated outcomes for adaptation, food security and local economic development. Habitat creation produced adaptation outcomes, and interventions harnessing nature for food production generated food security and local economic development outcomes. Figure 7 shows the most commonly reported outcomes for the 164 nature-based interventions. All the interventions we reviewed reported contributing to at least one of the development outcomes from our list and some reported up to ten outcomes, with the average being four per intervention.



do nature-based interventions deliver local development outcomes?



Figure 7. Evidence map showing which types of intervention are associated with which types of outcomes

Note: This figure covers the 164 studies reviewed in detail. Relative width of lines indicates relative weight of evidence for a link.

For all five categories of intervention (ie protect, manage, restore, create, harness), positive development outcomes were more commonly reported than negative outcomes.

For protection, management and

restoration interventions, the most commonly reported positive outcomes were food security, local economic development and climate change adaptation (Figure 8a-c). For created habitat interventions they were climate change adaptation, disaster risk reduction and local economic development (Figure 8d). And for interventions to harness nature for food production they were food security, local economic development and rights, equality and empowerment (Figure 8e). Negative outcomes were reported more commonly from protection or management interventions than other types, and the most frequent related to social cohesion and security, rights equality and empowerment and food security. These findings resonate with those of others exploring the social impacts of protected areas (see Section 2). Box 3 provides insights into the detail of some of these outcomes.

We did not record the magnitude of impact (positive or negative), and since most interventions reported more than one outcome, some had a mixture of positive and negative outcomes. For example, an intervention may provide new jobs and increase income but cause conflict within a community. In some cases, a single outcome might have a mixed effect. For example, a nature-based food production intervention (in the 'harness' category) might make crop yields more resilient during droughts but lessen yield (compared with conventional alternatives) in normal years. In other cases, there may have been positive effects for some local people but disadvantages for others. These are discussed further in the section on trade-offs, below.

and security

0

Positive

10

Negative

do nature-based interventions deliver local development outcomes?





30

No effect

40

Unclear

50

Not reported

20

Mixed

do nature-based interventions deliver local development outcomes?



Figure 8c. Reported development outcomes from 90 restoration interventions

Figure 8d. Reported development outcomes from 46 habitat creation interventions



do nature-based interventions deliver local development outcomes?



Figure 8e. Reported outcomes from 86 interventions to harness nature for food production

BOX 3. Examples of reported development outcomes from investing in nature

PROTECT

Land and aquatic protection interventions can enhance food security by acting as a source of wild foods for humans and livestock, as well as supporting surrounding agricultural systems through ecosystem services. For example, in the Philippines, a wildlife sanctuary protecting a natural wetland is an important source of fish and ensures continued water supplies for local farmers (Mora-Garcia et al., 2020). Nature protection can also boost local economies by sustaining sources of income-generating goods such as marketable wild forest products (Baba & Hack, 2019). Protection can also generate income and jobs. For example, some wildlife conservancies in Kenya generate profits from nature-based tourism for participating communities (Osano et al., 2013). Protection may also provide jobs for rangers or wardens (FFI, 2018).

Nature protection interventions can, however, also deliver negative development outcomes. For example, a national park in the Democratic Republic of Congo is associated with increasing threats of problematic wildlife on surrounding farmland (Ayari & Counsell, 2017). The problem often lies not with the intervention itself but the way it is governed. For example, some protected areas have been associated with authorities assaulting local people — such as in national parks in Cameroon (Pyhala et al., 2016) and Democratic Republic of Congo (Rainforest Foundation UK, 2019).

MANAGE

Management interventions, such as for wildlife, can generate income for local people. For example, a community-based trophy-hunting scheme in Tajikistan (CITES, 2019b) generates hunting fees and jobs,

including jobs monitoring poaching. Community forest management generates timber sales and other forest products in Nigeria (Fischborn & Herr, 2015) and Malawi (Chishakwe et al., 2012). As with protection interventions, however, management interventions can inhibit or exclude key local livelihood activities. For example, a REDD+ forest management project in Vietnam banned livelihoods based on traditional swidden agriculture and forest resources (McElwee et al., 2017).

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RESTORE

Restoration interventions can re-introduce and/or diversify food and incomes. For example, in a pilot project in Viet Nam, reforested plots now provide smallholders with honey, animal fodder, timber and medicinal plants (Tran et al., 2019). Interventions can also generate jobs, for example in tree-planting (eg Mwangi & Evans, 2018). Restoration can help communities adapt to climate change and lessen their exposure to hazards. For example, the previously mentioned project in Viet Nam has helped stabilise soils, reduce erosion and regulate microclimates (Tran et al., 2019). Mangrove restoration can shelter coastal communities from storms (eg World Bank, 2016). However, restoration interventions can come at a cost. In Indonesia, for example, reforestation of unproductive crop land has increased biodiversity but has also decreased the value of saleable products, and hence local incomes (Fedele et al., 2018).

CREATE

Like restoration, habitat creation can reduce exposure to hazards, and help provide jobs and income. For example, coastal afforestation in Bangladesh has generated new jobs in tree bed preparation, raising seedlings, planting and maintaining young tree stands, while also protecting coastal infrastructure such as embankments and roads (Rahman et al., 2019). In Nepal, tree plantations in sparse forests and on uncultivated private lands as part of a REDD+ initiative have generated sales of non-timber forest products. Farmers can also harvest livestock fodder from the plantations, helping them raise goats and buffalo for meat and milk. Since these foods are resilient to adverse climate conditions, the plantations are also contributing to adaptation (Pandey et al., 2016). By contrast, however, some tree planting initiatives in Malawi are reported to have perpetuated local inequalities and provided the least benefit to the most vulnerable households (Wood et al., 2016).

HARNESS

Harnessing nature in nature-based food production systems often enhances food security. For example, efforts to increase soil quality and moisture, pollinator abundance, and to reduce pest and disease damage, can boost crop yields (eg Pisupati, 2010; UNDP, 2015). Diversifying crops can also improve nutritional security, as seen in India where traditional seed varieties have secured crops' nutritional value in one region (ActionAid, undated,a). And in Sudan, planting native tree, grass, and shrub species to prevent sand dune encroachment has also increased meat and milk supply from livestock grazing these areas (UNEP, 2016). Sometimes, nature-based food production exceeds subsistence needs, generating surpluses for sale and thus benefiting local economies. Reduced reliance on pesticides and fertilisers also cuts costs, as an agroecology project involving small and marginal farmers in India shows (UNDP, 2019). Seed banks or seed-sharing similarly cut costs (Gotor et al., 2014).

Harnessing nature for food production can make crops and livestock more resilient to droughts and climate change, contributing to adaptation and disaster risk reduction (Vignola et al., 2015). In Gambia and Ghana, inter- and mixed cropping, mulching, and agroforestry helps retain soil moisture and regulate temperatures during climate extremes (Badiie & Barrow, 2017; Kumar et al., 2015). Preserving diversity among local cultivars provides options for responding to climate change (eg UAWC, undated).

Investments in harnessing nature also often report benefits for rights, equality and empowerment (in 22% of the studies). Such interventions may revive traditional knowledge (Kumar et al., 2015) or involve capacity building, acquiring new skills and building knowledge-sharing platforms, as in Malawi's Farmer to Farmer Agroecology project (Bezner Kerr et al., undated).

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BASE A HOW ARE DEVELOPMENT OUTCOMES DELIVERED FROM NATURE-BASED INTERVENTIONS?

The conceptual framework for this review (Figure 2) highlights two key 'delivery pathways' through which nature-based interventions can affect development. The first is through the 'nature' pathway. Because people depend on nature (and poor, rural people especially so), development gains from naturebased interventions often come simply from ensuring nature's ongoing potential to deliver benefits. For example, a land restoration project that improves soil condition and fertility may help produce more fodder or food, thus improving food security. However, sometimes it is the process of planning and implementing interventions that directly contributes to positive and negative development outcomes, hereafter the 'implementation' pathway. For example, forest restoration might generate jobs for tree planters while an intervention which provides training for marginalised groups can foster their empowerment and improve

Figure 9. Development 'delivery pathways' from 164 nature-based interventions



equality in communities. A protected area might employ local rangers, and may bring roads and other infrastructure. Conversely, implementing protected area regulations may exclude local people from key resources.

In many cases both pathways operate simultaneously, hereafter referred to as 'nature-plus-implementation'. Two ecosystembased adaptation interventions in Colombia, for example, showed that conservation and restoration helped the ecosystem deliver better food security (due to more productive land and improved water quality) while implementing the interventions also brought jobs, capacity building, social cohesion and empowerment (Richerzagen et al., 2019). All five categories of interventions we reviewed had examples of all delivery pathways. 'Implementation' pathways were the least commonly reported, while 'nature' and 'nature-plus-implementation' were equally common (Figure 9).

B55 DO INTERVENTIONS DELIVER MULTIPLE DEVELOPMENT OUTCOMES? AND ARE THERE TRADE-OFFS?

In many cases, **nature-based interventions deliver multiple development outcomes**. These multiple benefits can arise in several ways:

- An intervention may deliver multiple development outcomes through a single effect. For example, harnessing nature for better crop yields could improve food security – but also provide a saleable surplus, thus improving local economic development.
- 2 The intervention may deliver multiple outcomes through multiple effects. For example, a protected area may provide ecotourism jobs that support local economies, and may also increase

availability of medicinal plants, thus supporting health improvements.

3 The intervention may deliver one outcome which subsequently contributes to another. For example, forest management could increase access to saleable forest products, generating income that may improve access to healthcare or education. So here, improvements to local economies lead to improvements in basic needs.

However, nature-based interventions that benefit one or more aspects of development can disadvantage others. Our analysis revealed three key forms of trade-offs:

- 1 Trade-offs between nature and development
- 2 Trade-offs between development outcomes, and
- 3 Trade-offs between local stakeholder groups.

3.5.1 Nature and development trade-offs

Previous sections have discussed how conservation interventions that protect nature can come at the expense of local people. Conversely, a small number of poorly managed nature-based interventions we reviewed delivered development benefits at the expense of nature. For example, rubbish generated by ecotourism in Sagamartha National Park in Nepal caused pollution (eg Pisupati, 2010). Similarly, ecotourists can damage coral reefs (UN Environment, 2019).

However, most interventions that reported negative outcomes for nature reported mostly negative development outcomes too — ie **interventions that are bad for nature are also often bad for people**. For example, commercial plantations in Indonesia that replaced native forests, although they generated some development gains by generating more income, decreased tree species richness, brought poorer water quality and exacerbated flooding during heavy rains (Fedele et al., 2018). Some interventions displaced damaging activities from one site to another ('leakage'). In Ethiopia, for example, exclosures successfully restored a degraded watershed, thereby improving fodder production, reducing soil erosion and improving carbon storage (with the potential to generate revenue from carbon offsets schemes). But the exclosures simultaneously drove up grazing on the remaining communal lands, degrading these, and also caused fuelwood shortages (Mekuria et al., 2015).

3.5.2 Trade-offs between development outcomes

Interventions can deliver a positive effect on one or more development outcomes and also a negative effect on others, resulting in a trade-off. For example, creating the Kakum Conservation Area in Ghana removed customary land and user rights from some locals, reducing their income and ability to meet other basic needs, including food and medicines. However, it also protected a watershed and improved water supplies. Overall, local people supported the intervention because of its wider environmental benefits (Cobinnah et al., 2015).

Most trade-offs between development outcomes were associated with protection interventions, while few were associated with harnessing nature for food production. However, overall the evidence base was small, and should be interpreted with caution.

3.5.3 Trade-offs between stakeholders

In some cases, nature-based interventions benefit some local stakeholders and disadvantage others. For example, in some interventions only people who owned land (eg Bedelian & Oguto, 2019) or who were already involved in decision making (eg Sapkota et al., 2019) could benefit. Similarly, poor community members may be hardest hit by restrictions on natural resource use. In Bangladesh, for example, banning fishing in a spawning ground sanctuary benefited wealthier fishers who could wait to reap the benefits of stock improvements. But poorer fishermen could ill-afford to lose income, and were sometimes forced to pay fines for continuing to fish (Reid & Ali, 2018).



This review found very few studies of naturebased interventions that reported effects on local peoples' poverty status (ie whether a nature-based intervention resulted in a change from poor to non-poor or vice versa) (Figure 10). There were 11 interventions that were reported to alleviate or reduce poverty , but in six interventions poverty was exacerbated.

This finding however, does not necessarily reflect what actually happens on the ground

Figure 10. Studies that reported on poverty impacts of nature-based interventions



absence of data is not evidence of absence of effect. The few reports found may be due to our search not explicitly targeting poverty effects. Nonetheless, as we searched for development outcomes more broadly, it appeared to us that there is a lack of evidence on how these outcomes translate to effects on poverty.

Poverty alleviation and reduction were associated with improvements in jobs and income but also changes in other dimensions of poverty. For example, a study of participatory forest management in Kilwa and Iringa districts in Tanzania reported that although this had generated limited household income benefits, the local communities involved perceived an improvement in poverty status. This was attributed to impacts on rights and empowerment including greater control of their forest (and an ability to exclude outsiders), regular access to forest products, and pride in recognition for their conservation efforts by other villages and the state (Gross Camp et al., 2017).

Negative effects on poverty were reported in relation to restrictions on access to key resources because of the nature-based intervention, as well as removal of land rights or overriding of traditional land-tenure systems which then had negative impacts on income and food security. For example, in Nigeria, the establishment of the Cross River National Park exacerbated local poverty by reducing the amount of land available for farming, and by placing restrictions on wildlife hunting (Isiugo & Obiaha, 2015).

There was not enough data to draw any link between the type of intervention and an effect on poverty. While most of the cases of negative poverty effects came from protected areas, such as the examples given above, protection was also associated with positive effects. A study in Cambodia, for example, found no evidence that protected areas exacerbated local poverty. Indeed, it found that people collecting forest products inside protected areas were significantly better off than those collecting outside them (Clements et al., 2014). Similarly, a study in Ethiopia found that national parks were likely to lessen poverty for those living in and near the parks (Estifanos et al., 2020). By contrast, protected areas in the Congo Basin were reported to have exacerbated poverty by cutting access to critical resources. They have also been associated with human rights abuses and a loss of land-tenure security (Pyhälä et al., 2016; Ayari & Counsell, 2017).

Different impacts might be explained by the national policy framework governing how, and by whom, protected areas and resources are managed and how local rights are recognised. In Cambodia, people are allowed to live in protected areas and practice traditional subsistence livelihoods. Cambodian law also recognises the traditional user rights associated with resin tapping, which are highly important to the rural poor (Clements et al., 2014). By contrast, in the Congo Basin — and in many countries beyond it — people are prevented from living in protected areas or have their access to resources or livelihoods activities curtailed (WRM, 2016).

Beekeeping is an important income source for many smallholder farmers in Ethiopia. policy regime, the effects may differ. For example, in Nepal, expansion of the Shuklaphanta Wildlife Reserve in 2002 displaced the Rana Tharus community, triggering conflicts over resettlement land, disrupting social relationships, reducing food security and inducing widespread poverty (Lam & Paul, 2013). On the other hand, tourism has reduced poverty in other protected areas in Nepal (den Braber et al., 2018). In Indonesia, two community forest management (CFM) interventions reported very different effects. A study in Ciomas Village, West Java, revealed that after six years of CFM, 30% of those involved had gained income, but overall the contribution was just 3% of annual income and they were still poor (Parhusip et al., 2019). By contrast, a CFM intervention in Tebing Siring village in South Kalimantan increased income by 26% in eight years, elevating participating households from 'poor' to 'middle class'. The income generation had other knock-on developmental effects including reduced hunger, improvements in children's education and welfare, increased ability to purchase

Even within the same country, under the same



3.7

assets such as motorbikes and mobile phones, and improved social cooperation (Hiratsuka et al., 2019).

> WHAT CHARACTERISTICS OF NATURE-BASED INTERVENTIONS INFLUENCE DEVELOPMENT AND POVERTY OUTCOMES?

Understanding the factors that mediate outcomes of nature-based interventions is crucial to maximising the potential for positive developmental impacts, and managing potential trade-offs. It was beyond our scope to systematically investigate governance, political, institutional, macroeconomic, and other contextual implementation factors. These are issues that should be prioritised for further study, as discussed in the next section.

We explored whether there was any link between who instigates or drives an intervention and the outcomes generated, but found insufficient evidence to make an authoritative conclusion. For, example, in all the cases where the intervention was instigated by international private sector organisations the development outcomes were negative, but there were very few examples of this kind.

However, one clear example highlighted the risks of power disparities. In a forest carbon project in Uganda, the private sector instigator claimed sole ownership of both the carbon credits and the timber produced through the intervention (Edstedt, 2018). The study's authors note that there was little or no opportunity for local people to set the agenda and influence how, when and in what way 'development' occured, noting that "local communities are experiencing all the costs while the foreign company gets all the benefits".

Indeed, across our dataset of studies, we found that outcomes were more often negative where there was little or no community engagement in the intervention's decision-making processes. This corroborates the findings of many studies discussed in Section 2. We found that interventions that deliberately aimed to benefit poor or disadvantaged groups were less likely to report negative outcomes, but the number of studies reporting on these target-specific effects was too small to make this finding conclusive.



Floating cultivation practices, Bangladesh. This traditional agricultural farming method is used as land is not available to cultivate for most of the year.

4.CONCLUSIONS AND IMPLICATIONS FOR FUTURE RESEARCH, POLICY AND PRACTICE

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Key messages

- Our findings confirm previous analyses and also provide a sound empirical evidence base to complement the wealth of anecdotal evidence on nature-development linkages.
- It is clear that nature-based interventions deliver a wide range of development outcomes for local people but there are a number of key knowledge gaps including:
 - The distributional effects of nature-based interventions who wins, who loses and which intervention processes produce equitable outcomes
 - The extent to which interventions affect local people's poverty status either for better or for worse
 - The efficacy of nature investments as a route to development (and poverty alleviation), compared with conventional development.
- Future analyses that were beyond the scope of this review should investigate:
 - How investing in nature delivers development outcomes, including which external governance, institutional, power, economic and political conditions enable or constrain that delivery
 - The timescales nature-based interventions need to deliver development outcomes, and how long it takes for additionalities and trade-offs to become clear.
- Key recommendations for policy and practice include:
 - Recognise the opportunity that investing in nature offers for development and the risks of biodiversity loss
 - Ensure that investments in nature are designed, implemented, and managed with full and active participation by local people and that local power dynamics are factored in
 - Ensure local peoples' rights are recognised and respected
 - Ensure robust social safeguards are in place
 - Support upscaling of well-designed investments in nature that generate benefits for people and nature
 - Implement the commitments in the Leaders' Pledge for Nature.

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STOCKTAKE: WHAT OUR FINDINGS TELL US ABOUT HOW INVESTING IN NATURE SUPPORTS LOCAL DEVELOPMENT

Development and poverty alleviation have been global political priorities for decades. And yet, despite the role of nature in supporting human wellbeing globally, nature-based interventions have historically played a low profile in the development arena. Nature was not a feature of the poverty reduction strategies that characterised the 1990s and 2000s, and was stuck at the bottom of the list of Millennium Development Goals agreed in 2000, rather than being seen as integral to achieving them all.

Framing the Sustainable Development Goals as a set of interrelated and interdependent ambitions helped refocus attention on nature's vital role development. Numerous reviews, such as the Millennium Ecosystem Assessment and IPBES global assessment report, have since reaffirmed nature's importance in sustainable development in terms of the benefits it generates for people.

Nature-based interventions have historically played a low profile in the development arena

Most recently, the devastation wreaked by COVID-19 has drawn increased attention to the opportunities for a more resilient, greener and sustainable recovery that actively investing and intervening in nature can provide.

This report has reviewed evidence on different approaches to protecting, managing, restoring, enhancing and harnessing nature on the ground, and how these have supported a range of *human development outcomes* for local people in low and lower-middle income countries. It complements publications that explore the *enabling context* (policy, economic governance and the machinery of government) for integrating nature into the decisionmaking processes of development and the various global and sectoral analyses that have documented nature's value to human wellbeing in general, and to specific development aspirations.

Our review examined several key questions about the human developmental effects of investing in nature:

- What kinds of investments, and what kind of nature? We identified a wide range of interventions, categorised into five key types: protection, management, restoration, creation of new habitats and harnessing nature for food production. In practice, nature-based interventions often involve a combination of these broad types. We found more evidence available on protection interventions than other types, and on interventions in forest ecosystems than any other type. And we found more evidence from sub-Saharan Africa than other regions.
- 2 Who instigates and who is involved in investments in nature? We found it was common for interventions to be driven by more than one actor — most commonly national governments and/or local communities. Even if local communities were not the main driver they were often actively involved in decision making.
- S What kinds of development outcomes are delivered, and to whom? A wide range of local development outcomes have been reported. The most frequently reported were local economic development (jobs and income) and food security, while the least frequent were health and energy security. We found more evidence for positive development outcomes than negative. However, as important as the effects themselves is how they are distributed. Distributional effects were recorded between communities and more

powerful external actors, between men and women, between richer and poorer or more marginalised members of the community, and between the landed and the landless. The studies offered varying levels of insight into these effects, but overall it was more likely that poorer or more marginalised groups lost out, compared with richer, more landed, or more powerful groups.

What types of outcomes are associated with what types of interventions? We found all the main types of nature-based interventions had generated evidence of development outcomes. For protection, management and restoration interventions, the most commonly reported positive outcomes were food security, local economic development and climate change adaptation. For created habitat interventions they were climate change adaptation, disaster risk reduction and local economic development. And for interventions to harness nature for food production they were food security, local economic development and rights, equality and empowerment. Negative

outcomes were reported more commonly

from protection or management

interventions than other types, and the most frequent related to conflict and security, rights equality and empowerment and food security.

5 How are outcomes delivered? Outcomes may arise directly from the benefits generated by and with nature; or as a result of implementing and managing the nature-based intervention (such as the jobs created); or as a combination of the two.

6 Can interventions deliver multiple development outcomes? And are there trade-offs? There is a wealth of evidence that investments in nature can provide a win-win for biodiversity and development. There is also much evidence suggesting investments can generate several different types of development outcomes, such as nature-based crops both improving food security and boosting local economies. However, interventions can also result in trade-offs - between stakeholders, between development outcomes, and between conservation and development objectives. Where interventions are bad for nature they also tend to have aspects that are bad for people too.



 Are development outcomes enough to change local people's poverty status?
 Very few of the reviewed studies specifically mentioned effects on poverty, revealing an important knowledge gap.
 There was no clear link between type of intervention and whether outcomes were positive or negative. Instead, the limited evidence suggests that the same type of intervention can produce positive and negative outcomes depending on the context.

What characteristics of naturebased interventions influence development and poverty outcomes?

Although it was beyond the scope of this current study to systematically investigate governance, political, institutional, macroeconomic, and other contextual implementation factors we did capture some intervention characteristics that appear to influence development outcomes. Specifically, we found that outcomes were more often negative where there was little or no community engagement in the intervention's decision-making processes. We also found that interventions that deliberately aimed to benefit poor or disadvantaged groups were less likely to report negative outcomes, but the number of studies reporting on these target-specific effects was too small to make this finding conclusive.

Outcomes were more often negative where there was little or no community engagement in the intervention's decisionmaking processes

These findings resonate with previous analyses of conservation and poverty (eg Roe et al., 2014) and ecosystem services and poverty (eg Schekenberg et al., 2018). **Moreover, our review of a large number of studies does much to confirm** previous analyses and provide a sound empirical evidence base to complement the wealth of anecdotal evidence on nature-development linkages.

Given the rapidly increasing political interest in nature-based interventions (an interest that has previously been lacking at high level) it is important that the evidence of what works and what doesn't is taken into account when planning and implementing future interventions.

4 2 KNOWLEDGE AND RESEARCH GAPS

Our analysis revealed key gaps in the evidence we were able to collect. Perhaps most critical are detailed insights into the distributional effects of nature-based interventions. Our review clearly showed that there are winners and losers, and that the losers are more often the poorer, more marginalised groups particularly the landless poor. These effects warrant deeper analysis so that intervention design and implementation can develop mechanisms to ensure outcomes are equitable.

A further knowledge gap is how effective nature-based interventions are for lifting people out of poverty. Although it is clear that multiple positive development outcomes are delivered, we found very limited evidence on whether these are sufficient to change poverty status. Studies have been conducted in some places for some types of interventions, but overall there appears to be little reporting on poverty impacts.

We also found little data that could be used to compare the effectiveness of nature-based interventions against other development and/ or poverty alleviation interventions. Similarly, very few studies reported on cost effectiveness or returns on investment. One intervention, planting broom grass on degraded grazing land, found a higher benefit-to-cost ratio than continued grazing (Reid & Adhikari, 2018). But such analyses are a rare exception to the norm. Back in 2005, the Poverty Environment Partnership commissioned an analysis of the economic case for investing in the environment to reduce poverty (Pearce, 2005). It identified returns on investment from agroforestry as particularly high, with benefit-cost ratios ranging from 1.7 to 6.1. Investments in wetland and mangrove conservation delivered benefitcost ratios of 1.2 to 7.4. And other case-specific investments (fisheries in Madagascar, wildlife in Southern Africa) were identified as particularly beneficial. The 2010 study by The Economics of Ecosystems and Biodiversity (TEEB) initiative explored returns on investment for different types of nature-based interventions, including protected areas and watersheds, but acknowledged the data were very place-specific and should be generalised with caution (TEEB, 2010). Recently, efforts have begun to document the numbers of jobs that nature-based interventions can generate, and the job returns per dollar invested (WWF & ILO, 2020). This kind of evidence, collected systematically, will be crucial to building the case for investing in nature for a post-COVID-19 recovery.

And finally, there are some key issues that we were not able to cover in this review and which warrant further analysis. The first of these is how investing in nature delivers development outcomes, and the external governance,

institutional, economic and political conditions that enable or constrain that delivery. And the second is the timescales over which development outcomes are delivered and trade-offs become clear. Trade-offs may sometimes be short-lived (for example restoration interventions that curtail fishing may lead to long-term sustainable livelihoods and better income). And there are also tradeoffs between short term benefits/costs and long-term benefits/costs. Understanding effects over time is crucial for assessing the effectiveness of investments in nature and for identifying the need for short-term compensation or social protection measures to be factored in to intervention design and implementation where needed.

A BRECOMMENDATIONS FOR POLICY AND PRACTICE

It is clear from our review that investing in nature can deliver a wide range of development outcomes for local people in low and lower-middle income countries. Our first recommendation, therefore, is 1 that development organisations should pay greater attention to the opportunities that nature-based interventions offer and to the risks of biodiversity loss. However, not all investments in nature bring

A mangrove nursery in Pulau Dua Nature Reserve, Indonesia.





benefits to local people. And even where they do, the benefits are often unequally and inequitably distributed, with the poorest and most marginalised people losing out. How do we redress this situation? One key factor appears to be the level of community engagement. Our review found that outcomes were more likely to be negative where there was a low level of community engagement, whereas active involvement was associated with more positive outcomes.

We do not suggest only local engagement is necessary - interventions need a supportive external policy, governance and economic environment. But successful, sustainable solutions need local buy in and ownership, which means implementers need to understand local needs, perspectives and aspirations. Communities are not homogeneous. They have multiple competing interests and power dynamics. Practitioners who design and implement nature-based interventions need to understand and take account of these, so that benefits are not just captured by the most powerful, leaving the more marginalised to endure the costs. So, our second recommendation is that practitioners should 2 ensure that investments in nature are designed, implemented, and managed with

full and active local participation, and that local power dynamics are factored in.

Our review found that many of the negative outcomes local people experienced from nature-based interventions were associated with restrictions on (or disregard for) land and resource access and tenure rights. And yet the IPBES Global Assessment clearly showed that nature loss is happening less slowly on land owned or managed by Indigenous People and local communities. Weakening local rights is thus not just bad for people but also for nature. So, our third recommendation is to **③ ensure local peoples' rights are recognised, respected and actively championed.**

Building on this, our fourth recommendation is that practitioners **3 ensure robust social safeguards are in place when nature-based interventions are designed and implemented.** This is actually a relatively low ambition recommendation: safeguards are only intended to prevent negative impacts, not actively seek benefits. However, they are a critical first step.

Social safeguards have already been developed for some forms of nature investments. For example, COP16 of the UNFCCC agreed a set of safeguards for REDD+ interventions in response to concerns about land and resource rights.¹³ These safeguards have been elaborated upon by various agencies and NGOs, although challenges remain in terms of their implementation, monitoring and enforcement (Silori et al., 2013).

Human rights groups, Indigenous Peoples' organisations and others have expressed concern at a proposed target within the emerging CBD post-2020 Global Biodiversity Framework to protect at least 30% of the Earth's surface.¹⁴ The human costs of this proposal could be immense if 'protection' is not aligned with, and supportive of, local land and resource rights (RRI, 2020). Human rights advocates have thus argued that legally enforceable safeguards are included with this target (FPP 2021). A recent review of WWFsupported protected areas highlighted how human rights abuses can and do occur when investments in nature ride roughshod over local rights (Pillay et al., 2020). In response, WWF has strengthened its social safeguards for future investments.¹⁵ But at present there is nothing ensuring other organisations use similar safeguards, even though the Conservation Initiative on Human Rights¹⁶ has been in place for over ten years and, on paper, commits seven international conservation organisations (including WWF) to respecting human rights and promote them in their conservation programmes.

Development finance institutions, including the World Bank and International Finance Corporation, have social safeguard systems in place for many development projects, addressing issues such as displacement and involuntary resettlement, participation and inclusion of Indigenous Peoples, and free prior and informed consent.¹⁷ Some funds, including the Global Environment Facility and Green Climate Fund, have similar policies¹⁸ which cover their own nature-based investments. But there is still no widely accepted set of social safeguards that applies to all.

The IUCN Global Standard for Nature-based Solutions (IUCN, 2020) is an important step in the right direction. The standard provides criteria for evaluating NbS plans and practice, including around governance and social trade-offs, emphasising that NbS should be fair and equitable.

Our first two recommendations are consistent with the NbS Guidelines,¹⁹ which state that sustainable, successful nature-based solutions should be "designed, implemented, managed and monitored by or in partnership with Indigenous Peoples and local communities through a process that fully respects and champions local rights and knowledge, and generates local benefits". Our recommendations are also consistent with the Principles for Locally Led Adaptation²⁰ which (amongst other things) emphasise the need to

- 13 Z redd.unfccc.int/fact-sheets/safeguards.html
- 14 🔁 openlettertowaldronetal.wordpress.com/
- 15 Z wwf.panda.org/discover/people_and_conservation/advancing_social_policies_and_principles/
- 16 🔁 www.thecihr.org
- 17 2 www.worldbank.org/en/projects-operations/environmental-and-social-framework and 2 www.ifc.org/wps/wcm/connect/Topics_Ext_Content/IFC_External_Corporate_Site/Sustainability-At-IFC/ Policies-Standards/Performance-Standards
- 18 www.thegef.org/documents/environmental-and-social-safeguard-standards and www.greenclimate.fund/projects/safeguards/ess
- 19 🔁 nbsguidelines.info/
- 20 🔁 www.iied.org/principles-for-locally-led-adaptation

give local communities decision-making power over how adaptation actions are defined, designed and implemented, and to integrate gender-based, economic and political equalities into their core.

Our review examined a wealth of investments in nature from across the global South, collating numerous success stories. Yet we know there are many other brilliant but diverse and scattered examples. The challenge is how to scale them up and also scale them 'out'.

A recent EU workshop exploring the potential for scaling up NbS highlighted the difficulties in scaling out context-specific local successes across landscapes.²¹ However, success stories do exist. For example, the Forest and Farm Facility (FFF)²² funding platform, hosted by the UN Food and Agriculture Organisation, directly supports small-scale forest and farm producer organisations to build their enterprises, organise and federate themselves and influence policy in order to achieve landscape protection and restoration at scale. Upper-middle- and high-income countries also have examples of large-scale green jobs schemes that poorer countries could replicate, including the well-known "Working for" programmes in South Africa.²³ So, this becomes our fifth recommendation: **5** support upscaling of proven successful approaches that deliver benefits for nature and for people.

Of course, scaling efforts will need accompanying policy change that recognises that a singular pursuit of GDP growth is not sustainable development and that nature is an asset (Dasgupta, 2021) to be mainstreamed into climate and development strategies, and reflected in decision-making systems and associated information systems. There is a growing body of experience on how to achieve this.²⁴ Economic signals are also needed to incentivise investing in nature, eliminate perverse subsidies for damaging practices, and make commodities that destroy nature unacceptable in society. Again, recent examples of progress do exist, including the UK Environment Bill, which tackles deforestation in supply chains.

Our final recommendation is that all countries should **6** implement the Leader's Pledge for Nature, which came out of the 2020 UN Biodiversity Summit. The Pledge committed countries to putting nature at the heart of COVID-19 recovery strategies and at the heart of international and national development - including through scaling up NbS. To date, only a few countries have nature-based investments or policies in their recovery proposals (in both the global North and South) but there are a wide range of economic, fiscal and policy options that could be deployed (McElwee et al., 2020). Although COVID-19 put paid to the 2020 super year for nature, it could provide the political and social momentum to make 2021 the start of a new era for people and nature.

Alleviating poverty, tackling climate change, reducing biodiversity loss (and preventing future pandemics) are all international policy priorities. But these challenges need to be addressed locally, and it is crucial that interventions developed to do so are indeed 'nature-based solutions', not 'nature-based problems'.

²¹ Z www.naturebasedsolutionsinitiative.org/news/report-workshop-on-mobilizing-up-scaling-of-nature-based-solutions-for-climate-change-throughout-2020-and-beyond/

^{22 🔀} www.fao.org/forest-farm-facility/about/en/

²³ www.environment.gov.za/projectsprogrammes#workingfor

²⁴ See for example 🔀 www.iied.org/mainstreaming-nature-biodiversity-wider-planning-policy

REFERENCES²⁵

ActionAid (undated) 52 Profiles on Agroecology: Improving food security, nutrition and income of tribal smallholder farmers in Sundagarh District, Odisha, India Attp://www.fao.org/3/a-bt152e.pdf

Adhikari, S, Baral, H and Nitschke, C (2018) Adaptation to Climate Change in *Panchase* Mountain Ecological Regions of Nepal. *Environments* 5(3), 42. doi:10.3390/environments5030042

Aggarwal, A and Brockington, D (2020) Reducing or creating poverty? Analyzing livelihood impacts of forest carbon projects with evidence from India. *Land Use Policy* 95, 104608. doi: 10.1016/j.landusepol.2020.104608

Aguilar, L, Quesada-Aguilar, A and Shaw, DMP (eds) (2011) Forests and Gender. Gland, Switzerland: IUCN and New York, NY: WEDO.

Ali, A and Rahut, D (2019) Localized Floods, Poverty and Food Security: Empirical Evidence from Rural Pakistan. *Hydrology* 7(1), 2. doi: 10.3390/hydrology7010002

Allen, T, Murray, KA, Zambrana-Torrelio, C, Morse, SS, Rondinini, C, Di Marco, M, Breit, N, Olival, KJ and Dasza, P (2017) Global hotspots and correlates of emerging zoonotic diseases. *Nat Commun* 8, 1124. A https://doi.org/10.1038/ s41467-017-00923-8

Andam, K, Ferraro, P, Sims, K, Healy, A and Holland, M (2010) Protected areas reduced poverty in Costa Rica and Thailand. *Proceedings Of The National Academy Of Sciences* 107(22), 9996-10001. doi:10.1073/pnas.0914177107 Angelsen, A, Jagger, P, Babigumira, R, Belcher, B, Hogarth, N, Bauch, S, Börner, J, Smith-Hall, C and Wunder, S (2014) Environmental Income and Rural Livelihoods: A Global-Comparative Analysis. *World Development* 64, S12–S28. doi:10.1016/j.worlddev.2014.03.006

Antwi-Baffour SS, Bello AI, Adjei DN, Mahmood SA and Ayeh-Kumi PF (2014) The place of traditional medicine in the African society: the science, acceptance and support. *Am J Health Res.* 2(2), 49–54.

Baba, CAK and Hack, J (2019) Economic valuation of ecosystem services for the sustainable management of agropastoral dams. A case study of the Sakabansi dam, northern Benin, *Ecological Indicators* 107.

Bass, S (2019) Chapter 6: *Institutional reform for inclusive green economies*. In Eaton, D and Sheng, F (eds) Inclusive green economy: policies and practice. Dubai, Shanghai: Zayed International Foundation for the Environment and Tongji University.

Bedelian, C and Ogutu, JO (2017) Trade-offs for climate-resilient pastoral livelihoods in wildlife conservancies in the Mara ecosystem, Kenya. *Pastoralism* 7(1)
10.1186/s13570-017-0085-1

Beymer-Farris, B and Bassett, TJ (2011) The REDD menace: Resurgent protectionism in Tanzania's mangrove forests. *Global Environmental Change* 22(2): 332–341. https://doi.org/10.1016/j. gloenvcha.2011.11.006

Bezner-Kerr, R (undated) 52 Profiles on Agroecology: Malawi Farmer to Farmer Agroecology project www.fao.org/3/a-br095e.pdf

25 For a full list of references included in the review please contact 🔽 dilys.roe@iied.org

Blomley, T, Lukumbuzya, K and Brodnig, G (2011) *Participatory Forest Management and REDD+ in Tanzania*. World Bank, Washington, DC.

Blue Solutions (2018) 'Kick-starting marine conservation through local fisheries management'. Solutions in Focus: Sustainable Fisheries and Aquaculture.

Bowler, D, Buyung-Ali, L, Healey, J, Jones, J, Knight, T and Pullin, A (2012) Does community forest management provide global environmental benefits and improve local welfare? *Frontiers In Ecology And The Environment* 10(1), 29–36.

Brockington, D and Duffy, R (eds) (2011) *Conservation and Capitalism.* Wiley-Blackwell, Oxford.

Brockington, D and Igoe, J (2006) Eviction for conservation: a global overview. *Conservation and Society* 4(3), 424–470.

Brockington, D and Wilkie, D (2015) Protected areas and poverty. *Philosophical Transactions of the Royal Society B: Biological Sciences* 370(1681): 20140271.

Brown, D, Dettmann, P, Rinaudo, T, Tefera, H and Tofu, A (2010) Poverty Alleviation and Environmental Restoration Using the Clean Development Mechanism: A Case Study from Humbo, Ethiopia. *Environmental Management* 48(2), 322–333.
A doi:10.1007/s00267-010-9590-3

Callicott, JB, Crowder, LB and Mumford, K (1999) Current Normative Concepts in Conservation. *Conservation Biology* 13(1), 22–35.

Cardinale, BJ, Duffy, JE, Gonzalez, A, Hooper, DU, Perrings, C, Venail, P, Narwani, A, Mace, GM, Tilman, D and Wardle, DA (2012) Biodiversity loss and its impact on humanity. *Nature* 486, 59–67. Casson, L (2020) Can coronavirus make politicians take the loss of nature seriously?? https://medium.com/@louisacasson/ can-coronavirus-make-politicians-take-theloss-of-nature-seriously-bcafe4a3c10d

Cawthorn, D and Hoffman, L (2015) The bushmeat and food security nexus: A global account of the contributions, conundrums and ethical collisions. *Food Research International* 76, 906–925.

Chausson, A, Turner, B, Seddon, D, Chabaneix, N, Girardin, C, Kapos, V, Key, I, Roe, D, Smith, A, Woroniecki, S and Seddon, N (2020) Mapping the effectiveness of nature-based solutions for climate change adaptation. *Global Change Biology* 26(11), 6134–6155.

Chishakwe, N, Murray, L and Chambwera M (2012) Building climate change adaptation on community experiences: Lessons from community-based natural resource management in southern Africa, International Institute for Environment and Development. London.

Chowdhury, M, Walles, B, Sharifuzzaman, S, Shahadat Hossain, M, Ysebaert, T and Smaal, A (2019) Oyster breakwater reefs promote adjacent mudflat stability and salt marsh growth in a monsoon dominated subtropical coast. *Scientific Reports* 9(1).

Cinner, J, Huchery, C, Darling, E, Humphries, A, Graham, N, Hicks, C, Marshall, N and McClanahan, T (2013) Evaluating Social and Ecological Vulnerability of Coral Reef Fisheries to Climate Change. *Plos ONE* 8(9), e74321.

CITES (2019a) Cape aloe harvesting and trade in South Africa. CITES and Livelihoods Case Study.

CITES (2019b) Community-based trophy hunting of Ibex and Markhor in Tajikistan. CITES and Livelihoods Case Study. Coad, L, Fa, J, Abernethy, K, Van Vliet, N, Santamaria, C, Wilkie, D, El Bizri, HR, Ingram, DJ, Cawthorn, D-M and Nasi, R (2019) Toward a sustainable, participatory and inclusive wild meat sector. CIFOR.

Cohen-Shacham, E, Walters, G, Janzen, C and Maginnis, S (eds) (2016) Nature-based solutions to address global societal challenges. IUCN, Gland, Switzerland. Attp://dx.doi. org/10.2305/IUCN.CH.2016.13.en

Colchester, M (1995). Hunting for indigenous people's gene. Cited in Skutnabb-Kangas, T (1998) Human rights and language wrongs — a future for diversity. *Language Sciences*, 20:1, 5–27.

Coppock, D, Fernández-Giménez, M, Hiernaux, P, Huber-Sannwald, E, Schloeder, C and Valdivia, C, Arredondo, JT, Jacobs, M, Turin, C and Turner, M (2017) Rangeland Systems in Developing Nations: Conceptual Advances and Societal Implications. *Rangeland Systems* 569–641.

🔀 doi:10.1007/978-3-319-46709-2_17

Crossland, M, Winowiecki, LA, Pagella, T, Hadgu, K and Sinclair, F (2018) Implications of variation in local perception of degradation and restoration processes for implementing land degradation neutrality, *Environmental Development* 28, 42–54.

Cuc, N (2015) 'Mangrove forest restoration in northern Viet Nam.' In: Kumar, C, Begeladze, S, Calmon, M and Saint-Laurent, C, (eds) Enhancing food security through forest landscape restoration: Lessons from Burkina Faso, Brazil, Guatemala, Viet Nam, Ghana, Ethiopia and Philippines, pp. 106-121. Gland, Switzerland: IUCN.

den Braber, B, Evans KL and Oldekop, JA (2018) Impact of protected areas on poverty, extreme poverty, and inequality in Nepal. *Conserv. Lett.* 11, e12576.

Descheemaeker, K, Mapedza, E, Amede, T and Ayalneh, W (2010) Effects of integrated watershed management on livestock water productivity in water scarce areas in Ethiopia. *Physics And Chemistry Of The Earth, Parts A/B/C* 35(13–14), 723-729. doi:10.1016/j.pce.2010.06.006

Díaz, S, Demissew, S, Carabias, J, Joly, C, Lonsdale, M, Ash, N, Larigauderie, A, Adhikari, JR, Arico, S, Báldi, A and Bartuska, A (2015) The IPBES Conceptual Framework connecting nature and people. *Current Opinion in Environmental Sustainability* 14, 1–16.

Díaz, S, Pascual, U, Stenseke, M, Martín-López, B, Watson, R, Molnár, Z, Hill, R, Chan, K, Baste, I, Brauman, K, Polasky, S, Church, A, Lonsdale, M, Larigauderie, A, Leadley, P, van Oudenhoven, A, van der Plaat, F, Schröter, M, Lavorel, S, Aumeeruddy-Thomas, Y, Bukvareva, E, Davies, K, Demissew, S, Erpul, G, Failler, P, Guerra, C, Hewitt, C, Keune, H, Lindley, S and Shirayama, Y (2018) Assessing nature's contributions to people. *Science* 359(6373), 270–272.

Doswald, N, Munroe, R, Roe, D, Giuliani, A, Castelli, I, Stephens, J, Möller, I, Spencer, T, Vira, B and Reid, H (2014) Effectiveness of ecosystem-based approaches for adaptation: review of the evidence-base. *Climate And Development* 6(2), 185–201. doi: 10.1080/17565529.2013.867247

Ducarme, F and Couvet, D (2020) What does 'nature' mean? *Palgrave Communications* 6(1). doi: 10.1057/s41599-020-0390-y

Dudley, N (ed.) (2008) *Guidelines for Applying Protected Areas Management Categories*. IUCN, Gland, Switzerland.

Duncan, C, Primavera, J, Pettorelli, N, Thompson, J, Loma, R and Koldewey, H (2016) Rehabilitating mangrove ecosystem services: A case study on the relative benefits of abandoned pond reversion from Panay Island, Philippines. *Marine Pollution Bulletin* 109(2), 772–782. Dung, NT (2017) Agroecology program in Xuan An and Ngoc Son, Vietnam. 52 *Profiles in Agroecology*. FAO.

Edstedt, K and Carton, W (2018) The benefits that (only) capital can see? Resource access and degradation in industrial carbon forestry, lessons from the CDM in Uganda. *Geoforum* 97, 315–323. I doi:10.1016/j.geoforum.2018.09.030

Emerton, L (2017) Valuing the Benefits, Costs and Impacts of Ecosystem-Based Adaptation Measures: A Sourcebook of Methods for Decision-Making; GIZ: Bonn, Germany.

ESPA (2018) An environment for wellbeing: Pathways out of poverty – Policy messages from the ESPA programme. Edinburgh: Ecosystem Services for Poverty Alleviation.

Esteva, G (1992) Development. In Sachs, W (ed.) The Development Dictionary. A Guide to Knowledge and Power. Zed Books, London.

FAO (2020) *The State of World Fisheries and Aquaculture 2020. Sustainability in action.* Rome.

FAO (2016) Malawi Farmer to Farmer Agroecology Project. 52 Profiles on Agroecology.

FAO and UNEP (2020) *The State of the World's Forests 2020. Forests, biodiversity and people.* Rome.

FAO and Agricord (2016) "Forest user group rewarded for restoring water table". Forest and Farm Producer Organizations: Operating Systems for the SDGs.

Fedele, G, Locatelli, B, Djoudi, H and Colloff, M (2018) Reducing risks by transforming landscapes: Cross-scale effects of land-use changes on ecosystem services. *PLOS ONE* 13(4), e0195895.

Z doi:10.1371/journal.pone.0195895

FFI and East African Wildlife Society (2017) Marine resources co-management – lessons learned from Kenya: an Arcadia Marine case study. FFI, Cambridge, UK.

FFI (2018) 'Conserving Turtles on Nicaragua's Pacific Coast'. *Arcadia Marine Initiative*. *Annual Report* 2018.

FFI (2018) 'Community Conserved Areas, South Kenya Coast'. *Arcadia Marine Initiative. Annual Report 2018*.

FPP (2021) Re-thinking nature-based solutions: seeking transformative change through culture and rights. Forest Peoples' Programme, Moreton-in-Marsh, UK.

FOLU (2019) Growing Better: Ten Critical Transitions to Transform Food and Land Use.

Gandiwa, E, Heitkönig, IMA, Lokhorst AM, Prins, HHT and Leeuwis, C (2013) CAMPFIRE and human-wildlife conflicts in local communities bordering northern Gonarezhou National Park, Zimbabwe. *Ecol. Soc.* 18(4).

GIZ (2018) "Resilient Rural Livelihoods through Eco-Restoration and Sustainable Natural Resources Management". Solutions in Focus: Ecosystem-Based Adaptation from Mountains to Oceans. How people adapt to climate change by using nature. Bonn and Eschborn.

Gotor, E, Fadda, C, Rüdiger, A and Trincia C (2014) Matching Seeds to Needs — female farmers adapt to a changing climate in Ethiopia. *Bioversity International Series of Impact Assessment Briefs* no. 14. Bioversity International. Griffiths, T (2007) Seeing RED? Avoided Deforestation and the Rights of Indigenous Peoples and Local Communities. Forest Peoples Programme, Moreton-in-Marsh.

Griscom, B, Adams, J, Ellis, P, Houghton, R, Lomax, G, Miteva, D, Schlesinger, W, Shoch, D, Siikamäki, J, Smith, P, Woodbury, P, Zganjar, C, Blackman, A, Campari, J, Conant, R, Delgado, C, Elias, P, Gopalakrishna, T, Hamsik, M, Herrero, M, Kiesecker, J, Landis, E, Laestadius, L, Leavitt, S, Minnemeyer, S, Polasky, S, Potapov, P, Putz, F, Sanderman, J, Silvius, M, Wollenberg, E and Fargione, J (2017) Natural climate solutions. *Proceedings Of The National Academy Of Sciences* 114(44), 11645–11650. doi: 10.1073/pnas.1710465114

Haas, JC, Loft, L and Pham, TT (2019) How fair can incentive-based conservation get? The interdependence of distributional and contextual equity in Vietnam's payments for Forest Environmental Services Program. *Ecological Economics* 160, 205–2014.

Hajjar, R, Oldekop, JA, Cronkleton, P, Newton, P, Russell, AJM and Zhou, W (2020) A global analysis of the social and environmental outcomes of community forests. *Nature Sustainability* November, 1–9.

Hickel, J (2020) *Less is More*. Penguin Random House, London.

Hiratsuka, M, Nakama, E, Satriadi, T, Fauzi, H, Aryadi, M and Morikawa, Y (2019) An approach to achieve sustainable development goals through participatory land and forest conservation: a case study in South Kalimantan Province, Indonesia, *Journal of Sustainable Forestry* 38(6), 558–571 doi:10.1080/10549811.2019.1598440

HLPE (2017) "Sustainable Forestry for Food Security and Nutrition: A Report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security". *Report of the High Level Panel of* Holdgate, M (1999) *The Green Web: A Union for World Conservation.* Earthscan, London.

IIED and IUCN-SULi (eds) (2019) *Communityled approaches to tackling illegal wildlife trade: case studies from Latin America.* IIED, London.

Imam, M, Haque, M and Yunus, S (2016) Scarcity to solution: perceived reasons for safe drinking water scarcity and local coping responses in a coastal village of Bangladesh. *Journal Of Water And Climate Change* 7(3), 542–550. Additional doi:10.2166/wcc.2016.090

Indenbaum RA, Timoshyna A and Lotz A (2018) Enhancing management and benefit flows in Viet Nam's wild medicinal products. TRAFFIC. Hanoi, Viet Nam.

IPBES (2019) Global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. Brondizio, ES, Settele, J, Díaz, S and Ngo HT (eds). IPBES secretariat, Bonn, Germany.

IPCC (2019a) Climate Change and Land: an IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems.

IPCC (2019b) IPCC Special Report on the Ocean and Cryosphere in a Changing Climate.

IRP (2019) Land Restoration for Achieving the Sustainable Development Goals: An International Resource Panel Think Piece. United Nations Environment Programme, Nairobi, Kenya.

Isbell, F, Craven, D, Connolly, J, Loreau, M, Schmid, B, Beierkuhnlein, C, Bezemer, TM, Bonin, C, Bruelheide, H, de Luca, E, Ebeling, A, Griffin, J, Guo, Q, Hautier, Y, Hector, A, Jentsch, A, Kreyling, J, Lanta, V, Manning, P, Meyer, S, Mori, A, Naeem, S, Niklaus, P, Polley, HW, Reich, P, Roscher, C, Seabloom, E, Smith, M, Thakur, M, Tilman, D, Tracy, B, van der Putten, W, van Ruijven, J, Weigelt, A, Weisser, W, Wilsey, B and Eisenhauer, N (2015) Biodiversity increases the resistance of ecosystem productivity to climate extremes. *Nature* 526, 547–577.

IUCN (2009) No time to lose: make full use of nature-based solutions in the post-2012 climate change regime. *Position paper on the fifteenth session of the conference of the parties to the United Nations Framework Convention on Climate Change* (COP 15). IUCN, Gland. Import/downloads/iucn_position_paper_ unfccc_cop_15.pdf

IUCN (2018) Solutions in Focus: Communityled Successes in Marine Conservation. Available at: ➢ https://portals.iucn.org/ library/sites/library/files/documents/2018-045-En.pdf

IUCN (2020) Global Standard for Nature-based Solutions. *A user-friendly framework for the verification, design and scaling up of NbS*. First edition. Gland, Switzerland: IUCN.

IUCN (2021) Situation Analysis on the Roles and Risks of Wildlife in the Emergence of Human Infectious Diseases IUCN, Gland, Switzerland.

Jones, K, Patel, N, Levy, M, Storeygard, A, Balk, D, Gittleman, J and Daszak, P (2008) Global trends in emerging infectious diseases. *Nature* 451, 990–993. Attps://doi.org/10.1038/nature06536

Kapos, V, Wicander, S, Salvaterra, T, Dawkins, K and Hicks, C (2019) *The Role of the Natural Environment in Adaptation*, Background Paper for the Global Commission on Adaptation. Rotterdam and Washington, D.C. Global Commission on Adaptation.

Kimiti, D, Riginos, C and Belnap, J (2016) Low-cost grass restoration using erosion barriers in a degraded African rangeland. *Restoration Ecology*, 25(3), 376–384. doi: 10.1111/rec.12426

Kumar, C, Begeladze, S, Calmon, M and Saint-Laurent, C (eds) (2015) *Enhancing food security through forest landscape restoration: Lessons from Burkina Faso, Brazil, Guatemala, Viet Nam, Ghana, Ethiopia and Philippines.* Gland, Switzerland: IUCN. pp. 5–217.

Kupika, O, Gandiwa, E, Nhamo, G and Kativu, S (2019) Local Ecological Knowledge on Climate Change and Ecosystem-Based Adaptation Strategies Promote Resilience in the Middle Zambezi Biosphere Reserve, Zimbabwe. *Scientifica*, 1–15. Z doi:10.1155/2019/3069254

Lange, G-M, Wodon, Q and Carey, K (2018) *The Changing Wealth of Nations 2018. Building a Sustainable Future.* Washington, DC: World Bank.

Lam, LM and Paul, S (2013) Displacement and Erosion of Informal Risk-Sharing: Evidence from Nepal, *World Development*, 43, 42–55.

Leisher, C, Carlton, VA, Van Beukering, P and Scherl, LM (2007) Nature's investment bank: how marine protected areas contributed to poverty reduction. The Nature Conservancy, Carlton, Australia.

Leisher, C, Sanjayan, M, Blockhus, J, Larsen, N and Kontoleon, A (2012) Does Conserving Biodiversity Work to Reduce Poverty? A State of Knowledge Review. *Biodiversity Conservation And Poverty Alleviation: Exploring The Evidence For A Link*, 143–159. doi:10.1002/9781118428351.ch9 Lestari, S, Premono, B and Winarno, B (2019) Local people awareness towards social forestry program: a case study of Ogan Komering Ulu District, South Sumatra Province, Indonesia. *IOP Conference Series: Earth And Environmental Science*, 308, 012075.

Z doi:10.1088/1755-1315/308/1/012075

Lowore, J (2020) Understanding the Livelihood Implications of Reliable Honey Trade in the Miombo Woodlands in Zambia. *Frontiers In Forests And Global Change*, 3.

Lunga, W and Musarurwa, C (2016) *Exploiting indigenous knowledge commonwealth to mitigate disasters: from the archives of vulnerable communities in Zimbabwe*. Retrieved 28 November 2020, from Attp://nopr.niscair. res.in/handle/123456789/33551

Lyytimäki, J (2015) Ecosystem disservices: embrace the catchword. *Ecosyst Servs* 12:136.

Mace, G (2014) Whose conservation? *Science*, 345(6204), 1558–1560.

MacKinnon, K, Sobrevila, C and Hickey, V (2008) *Biodiversity, climate change and adaptation: nature-based solutions from the Word Bank portfolio.* World Bank, Washington, DC.

Malkamäki, A, D'Amato, D, Hogarth, N, Kanninen, M, Pirard, R, Toppinen, A and Zhou, W (2018) A systematic review of the socioeconomic impacts of large-scale tree plantations, worldwide. *Global Environmental Change*, 53, 90–103. Z doi:10.1016/j.gloenvcha.2018.09.001

Manchin, A (2010) *Most Europeans see biodiversity loss as serious problem, majority make some effort to preserve biodiversity.* Available at: Attp://www.gallup.com/ poll/139319/Europeans-Biodiversity-Loss-Serious-Problem.aspx Maxwell, S (1999) The meaning and measurement of poverty. *ODI Poverty Briefing* No 3. Overseas Development Institute, London.

McElwee, P, Turnout, E, Chiroleu-Assouline, M, Clapp, J, Isenhour, C, Jackson, T, Kelemen, E, Miller, D, Rusch, G, Spangenberg, J, Waldron, A, Baumgartner, R, Bleys, B, Howard, M, Mungatana, E, Ngo, H, Ring, I and Santos, R (2020) Ensuring a Post-COVID Economic Agenda Tackles Global Biodiversity Loss. *One Earth*, 3 (4) 448–461.

McKinnon, M, Cheng, S, Dupre, S, Edmond, J, Garside, R, Glew, L, Holland, M, Levine, E, Masuda, Y, Miller, D, Oliveira, I, Revenaz, J, Roe, D, Shamer, S, Wilkie, D, Wongbusarakum, S and Woodhouse, E (2016) What are the effects of nature conservation on human well-being? A systematic map of empirical evidence from developing countries. *Environmental Evidence*, 5(1). A doi:10.1186/s13750-016-0058-7

McShane, TO and Wells, MP (2004) *Getting Biodiversity Projects to Work*. Colombia University Press, New York.

Menton, M and Bennett, A (2018) Payments for ecosystem services and poverty alleviation? In: Schreckenberg, K, Mace, G and Poudyal, M (eds). *Ecosystem Services and Poverty Alleviation: Trade-offs and Governance.* Routledge, London.

Millennium Ecosystem Assessment (2005) Ecosystems and Human Well-Being: Our Human Planet: Summary for Decision Makers.

Miller, C (1998) Tapping the Rockies: Resource Exploitation and Conservation in the Intermountain West In: Hal K. Rothman (ed) *Reopening the American West*. University of Arizona Press, Tucson. 168–82.

Miller, DC, Mansourian, S and Wildburger, C (eds) (2020) Forests, Trees and the Eradication of Poverty: Potential and Limitations. A Global Assessment Report. 13–32. International Union of Forest Research Organizations. Mizrahi, M, Diedrich, A, Weeks, R and Pressey, R (2018) A Systematic Review of the Socioeconomic Factors that Influence How Marine Protected Areas Impact on Ecosystems and Livelihoods. *Society & Natural Resources*, 32(1), 4–20.

Mora-Garcia, C, Campos, R and Seronay, R (2020) Perceived ecosystem services towards the conservation of angusan marsh wildlife sanctuary in Mindanao, Philipines. *International Journal Of Conservation Science*, 11(1).

Mureithi, S, Verdoodt, A, Njoka, J, Gachene, C and Van Ranst, E (2015) Benefits Derived from Rehabilitating a Degraded Semi-Arid Rangeland in Communal Enclosures, Kenya. *Land Degradation & Development*, 27(8), 1853– 1862. Z doi:10.1002/ldr.2341

Mwangi, E and Evans, M (2018) Flood recovery, livelihood protection and mangrove reforestation in the Limpopo River estuary, Mozambique. CIFOR, Bogor, Indonesia.

Nature (2019) Biodiversity centre stage. *Nat Ecol Evol* 3, 861. Attps://doi.org/10.1038/ s41559-019-0922-2

Nature4Climate (2020) *Nature-positive recovery for people, economy, & climate.* https://nature4climate.org/naturepositive-recovery/

Naidoo, R, Gerkey, D, Hole, D, Pfaff, A, Ellis, AM, Golden, CD and Herrera, D (2019) Evaluating impacts of protected areas on human wellbeing across the developing world. *Science Advances* 5 (4): eaav3006.

Ngwese, N, Saito, O, Sato, A, Agyeman Boafo, Y and Jasaw, G (2018) Traditional and Local Knowledge Practices for Disaster Risk Reduction in Northern Ghana. *Sustainability*, 10(3), 825. Z doi:10.3390/su10030825 Norris, C, Hobson, P and Ibisch, P (2012) Microclimate and vegetation function as indicators of forest thermodynamic efficiency. *Journal Of Applied Ecology*, 49(3), 562–570. doi: 10.1111/j.1365-2664.2011.02084.x

OECD (2019) *Biodiversity Finance and the Economic and Business Case for Action*. Report prepared for the G7 Environmental Ministers's Meeting 5–6 May 2019.

Oldekop, J, Holmes, G, Harris, W and Evans, K (2015) A global assessment of the social and conservation outcomes of protected areas. *Conservation Biology*, 30(1), 133–141. doi: 10.1111/cobi.12568

Osano, P, Said, M, de Leeuw, J, Ndiwa, N, Kaelo, D, Schomers, S, Birner, R and Ogutu, J (2013) Why keep lions instead of livestock? Assessing wildlife tourism-based payment for ecosystem services involving herders in the Maasai Mara, Kenya. *Natural Resources Forum*, 37(4), 242– 256. Z doi: 10.1111/1477-8947.12027

Palomo, I, Felipe-Lucia, M, Bennett, M, Martín-López, B and Pascual, U (2016) "Disentangling the Pathways and Effects of Ecosystem Service Co-Production." *Advances in Ecological Research*. Vol. 54, Pp. 245–83.

Parhusip, S, Suharti, S, Sukandi, T, Amano, M, and Matsumura, N (2019) Economic analysis of local people's involvement in communitybased forest management (CBFM) in Desa Ciomas, Indonesia. *Japan Society of Forest Planning*. 0 (0), 1–14. doi.org/10.20659/jfp.2019.002

Parr, C, Lehmann, C, Bond, W, Hoffmann, W and Andersen, A (2014) Tropical grassy biomes: misunderstood, neglected, and under threat. *Trends In Ecology & Evolution*, 29(4), 205–213. doi: 10.1016/j.tree.2014.02.004

Pascual, U, Balvanera, P, Díaz, S, Pataki, G, Roth, E, Stenseke, M. Watson, R, Dessane, E, Islar, M, Kelemen, E, Maris, V, Quaas, M, Subramanian, S, Wittmer, H, Adlan, A, Ahn, S, Al-Hafedh, Y, Amankwah, E, Asah, S, Berry, P, Bilgin, A, Breslow, S, Bullock, C, Cáceres, D, Daly-Hassen, H, Figueroa, E, Golden, C, Gómez-Baggethun, E, González-Jiménez, D, Houdet, J, Keune, H, Kumar, R, Ma, K, May, P, Mead, A, O'Farrell, P, Pandit, R, Pengue, W, Pichis-Madruga, R, Popa, F, Preston, S, Pacheco-Balanza, D, Saarikoski, H, Strassburg, B, van den Belt, M, Verma, M, Wickson, F and Yagi, N (2017) Valuing nature's contributions to people: the IPBES approach. Current Opinion In Environmental Sustainability, 26–27, 7–16. 🔁 doi: 10.1016/j.cosust.2016.12.006

Pearce, D (2005) *Investing in Environmental Wealth For Poverty Reduction*. Poverty Environment Partnership, UNDP, New York.

Pillay, N, Knox, J and MacKinnon, K (2020) *Embedding Human Rights in Nature Conservation*. Report of the Independent Panel of Experts of the Independent Review of allegations raised in the media regarding human rights violations in the context of
WWF's conservation work. WWF
International, Switzerland
✓ https://wwfint.awsassets.panda.org/
downloads/independent_review____
independent_panel_of_experts__final_
report_24_nov_2020.pdf

Pisupati, B (2010) *Connecting the Dots: Biodiversity, Adaptation, Food security and Livelihoods.* UNEP, Nairobi.

Porras, I and Asquith, N (2018) *Ecosystems, poverty alleviation and conditional transfers: Guidance for practitioners*. IIED, London.

Pullin, A, Bangpan, M, Dalrymple, S, Dickson, K, Haddaway, N, Healey, J, Hauari, H, Hockley, N, Jones, J, Knight, T, Vigurs, C and Oliver, S (2013) Human well-being impacts of terrestrial protected areas. *Environmental Evidence*, 2(1), 19. Z doi:10.1186/2047-2382-2-19 Rahman, S, Islam, M, Khan, M and Touhiduzzaman, M (2019) Climate change adaptation and disaster risk reduction (DRR) through coastal afforestation in South-Central Coast of Bangladesh. *Management Of Environmental Quality: An International Journal*, 30(3), 498–517.

Rangan, H, Kull, C and Alexander, L (2010) Forest plantations, water availability, and regional climate change: controversies surrounding *Acacia mearnsii* plantations in the upper Palni Hills, southern India. *Regional Environmental Change* 10: 103–117.

Reaka-Kudla, ML, Wilsone, DE, Wilson, EO and Peter, FM (1997) *Biodiversity II: Understanding and Protecting Our Biological Resources.* Joseph Henry Press, Washington DC.

Reid, H, Hou Jones, X, Porras, I, Hicks, C, Wicander, S, Seddon, N, Kapos, V, Rizvi, AR and Roe, D (2019) *Is ecosystem-based adaptation effective? Perceptions and lessons learned from 13 project sites.* IIED, London.

Roe, D, Booker, F and Franks, P (2017) *Climate-Smart People-Centered Conservation: A Synthesis Report*. WWF-UK. Available at:

Roe, D, Elliott, J, Sandbrook, C and Walpole, M (2013) Tackling global poverty: what contributions can biodiversity and its conservation really make? In Roe, D, Elliott, J, Sandbrook, C and Walpole, M (eds) *Biodiversity Conservation and Poverty Alleviation: Exploring the Evidence for a Link.* Wiley Blackwell.

Roe, D, Seddon, N and Elliott, J (2019) Biodiversity loss is a development issue: a rapid review of evidence. IIED Issue Paper. IIED, London. A http://pubs.iied.org/17636IIED Rohr, JR, Barrett, CB, Civitello, DJ, Craft, M, Delius, B, DeLeo, G, Hudson, P, Jouanard, N, Nguyen, K, Ostfeld, R, Remais, J, Riveau, G, Sokolow, S and Tilman, D (2019) Emerging human infectious diseases and the links to global food production. *Nature Sustainability* 2, 445–456.

RRI (2020). Rights-Based Conservation: The path to preserving Earth's biological and cultural diversity? Rights and Resources Initiative, Washington, DC.

Russell, S, Tyrrell, P and Western, D (2018) Seasonal interactions of pastoralists and wildlife in relation to pasture in an African savanna ecosystem. *Journal Of Arid Environments*, 154, 70–81.

Samii, C, Lisiecki, M, Kulkarni, P, Paler, L and Chavis, L (2014a) Effects of decentralized forest management (DFM) on deforestation and poverty in low- and middle-income countries: a systematic review. *Campbell Systematic Reviews*, 10(1), 1–88. doi: 10.4073/csr.2014.10

Samii C, Lisiecki M, Kulkarni P, Paler L and Chavis, L (2014b) *Effects of payment for environmental services (PES) on deforestation and poverty in low and middle income countries: a systematic review* CEE 13–015b. Collaboration for Environmental Evidence.

Sapkota, T, Vetter, S, Jat, M, Sirohi, S, Shirsath, P, Singh, R, Jat, H, Smith, P, Hillier, J and Stirling, C (2019) Cost-effective opportunities for climate change mitigation in Indian agriculture. *Science Of The Total Environment*, 655, 1342–1354. SCBD (Secretariat of the Convention on Biological Diversity) (2009) Connecting biodiversity and climate change mitigation and adaptation: report of the second Ad Hoc technical expert group on biodiversity and climate change. *Technical series no.* 41. Secretariat of the Convention on Biological Diversity, Montreal.

SCBD (2020) *Global Biodiversity Outlook 5.* Secretariat of the Convention on Biological Diversity, Montreal.

Schrekenberg, K, Mace, G and Poudyal, M (2018) *Ecosystem Services and Poverty Alleviation. Trade-offs and Governance.* Earthscan, London.

Sears, R, Choden, K, Dorji, T, Dukpa, D, Phuntsho, S, Rai, P, Wangchuk, J and Baral, H (2018) Bhutan's Forests through the Framework of Ecosystem Services: Rapid Assessment in Three Forest Types. *Forests*, 9(11), 675. Addi: 10.3390/f9110675

Seddon, N, Chausson, A, Berry, P, Girardin, C, Smith, A and Turner, B (2020) Understanding the value and limits of nature-based solutions to climate change and other global challenges. *Philosophical Transactions Of The Royal Society B: Biological Sciences*, 375(1794), 20190120. doi: 10.1098/rstb.2019.0120

Seddon, N, Smith, P, Smith, A, Chausson, A, Girardin, C, House, J, Key, I, Shivastra, S and Turner, B (2021) Getting the message right on nature-based solutions to climate change. *Global Change Biology*, 27(8), 1518–1546.

Shekhar Silori, C, Frick, S, Luintel, H and Hari Poudyal, B (2013) Social safeguard in REDD+: A review of existing initiatives and challenges. *Journal of Forest and Livelihood*, 11(2), 27–36.

Strauch, A, Rurai, M and Almedom, A (2016) Influence of forest management systems on natural resource use and provision of ecosystem services in Tanzania. *Journal Of Environmental Management*, 180, 35–44. doi: 10.1016/j.jenvman.2016.05.004 Sunderland, TCH and O'Connor, A (2020) Forests and Food Security: A review. *CAB Reviews 2020*, 15 (19) 1–10 ref.98.

SwissRe Institute (2020) Biodiversity and Ecosystem Services: A business case for re/ insurance. Www.swissre.com/dam/ jcr:a7fe3dca-c4d6-403b-961c-9fab1b2f0455/ swiss-re-institute-expertise-publicationbiodiversity-and-ecosystem-services.pdf

Swan, SR, McNally, RHG, Grieg-Gran, M, Roe, D and Mohammed, EY (2011) Options for Promoting High-Biodiversity REDD+. IIED, London.

Sukhdev, P, Wittmer, H, Schröter-Schlaack, C, Nesshöver, C, Bishop, J, ten Brink, P, Gundimeda, H, Kumar, P and Simmons, B (2010) The Economics of Ecosystems and Biodiversity: Mainstreaming the Economics of Nature, a synthesis of the approach, conclusions and recommendations of TEEB. TEEB.

Tauli-Corpuz, V, Alcorn, J, Molnar, A, Healy, C and Barrow, E (2020) Cornered by PAs:
Adopting rights-based approaches to enable cost-effective conservation and climate action. *World Development*, 130, 104923.
Io: 10.1016/j.worlddev.2020.104923

Teshome, E, Shita, F and Abebe, F (2020) Current community based ecotourism practices in Menz Guassa community conservation area, Ethiopia. *Geojournal*.

Thevs, N, Gombert, A, Strenge, E, Lleshi, R, Aliev, K and Emileva, B (2019) Tree Wind Breaks in Central Asia and Their Effects on Agricultural Water Consumption. *Land*, 8(11), 167. Z doi: 10.3390/land8110167

UAWC (undated) 52 Profiles on Agroecology: Local Seed Bank in Palestine. FAO http://www.fao.org/3/a-bs178e.pdf Ulian, T, Sacandé, M, Hudson, A and Mattana, E (2016) Conservation of indigenous plants to support community livelihoods: the MGU – Useful Plants Project. *Journal Of Environmental Planning And Management*, 60(4), 668–683. doi: 10.1080/09640568.2016.1166101

UNDP (2015) Zoramb Naagtaaba Association, Burkina Faso. *Equator Initiative Case Study Series*. New York, NY.

UNDP (2016) Alliance for Integrated Development, Nepal. *Equator Initiative Case Study Series*. New York, NY.

UNDP (2018). Blue Economy: Community Solutions.

UNDP (2019) Swayam Shikshan Prayog, India. *Equator Initiative Case Study Series*. New York, NY.

Jones, PJS, Murray, RH and Vestergaard, O (2019) Enabling Effective and Equitable Marine Protected Areas – guidance on combining governance approaches. *Case Study Compendium*. UNEP, Nairobi.

UNEP (2010) Seed banking by the GREEN (Genetic Resource, Energy, Ecology and Nutrition) Foundation, India. *Connecting the dots: Biodiversity, Adaptation, Food Security and Livelihoods.* UNEP, Nairobi.

UNEP (2016) Wadi Partners: Food Security and Disaster Resilience through Sustainable Drylands Management in North Darfur, Sudan. UNEP, Nairobi.

United Nations (1992) The Convention on Biological Diversity. United Nations Environment Programme, Nairobi.

USAID (2019) Maintaining Water Security in Critical Water Catchments in Mongolia. www.climatelinks.org/resources/ maintaining-water-security-critical-watercatchments-mongolia Vignola, R, Harvey, CA, Bautista-Solis, P, Avelino, J, Rapidel, B, Donatti, C and Martinez, R (2015) Ecosystem-based adaptation for smallholder farmers: Definitions, opportunities and constraints. *Agriculture, Ecosystems & Environment*, 211, 126–132.

Vira, B, Wildburger, C and Mansourian, S (2015) *Forests, trees and landscapes for food security and nutrition*. International Union of Forest Research Organizations (IUFRO), Vienna.

Watson, R (2020) *Loss of biodiversity is just as catastrophic as climate change*. Available at: https://www.theguardian.com/ commentisfree/2019/may/06/biodiversityclimate-change-mass-extinctions

WEF (2020) *The Global Risks Report 2020*. 15th Edition.

Wells, J, Wilson, K, Abram, N, Nunn, M, Gaveau, D, Runting, R, Tarniati, N, Mengersen, K and Meijaard, E (2016) Rising floodwaters: mapping impacts and perceptions of flooding in Indonesian Borneo. *Environmental Research Letters*, 11(6), 064016. 2 doi: 10.1088/1748-9326/11/6/064016

WHO and CBD (2015) *Connecting global* priorities: biodiversity and human health: a state of knowledge review.

Wiik, E, Jones, J, Pynegar, E, Bottazzi, P, Asquith, N, Gibbons, J and Kontoleon, A (2020) Mechanisms and impacts of an incentive-based conservation program with evidence from a randomized control trial. *Conservation Biology*, 34(5), 1076–1088. Z doi: 10.1111/cobi.13508

Wilson, EO (1988) *BioDiversity*. National Academy of Science, Washington DC.

Wilson, EO (1992) *The Diversity of Life*. The Belknap Press of Harvard University Press, Cambridge, Massachusetts. Woldie, BA and Tadesse, SA (2019) Views and attitudes of local people towards community versus state forest governance in Tehulederi District, South Wollo, Ethiopia. *Ecol Process* 8(4).

Wood, BT, Quinn, CH, Stringer, LC and Dougill, A (2017) Climate Compatible Development Outcomes and their Implications for Distributive Justice: Evidence from Malawi. *Environmental Management* 60, 436–453.

World Bank (2016) Managing Coasts with Natural Solutions: Guidelines for Measuring and Valuing the Coastal Protection Services of Mangroves and Coral Reefs. Beck, MW and Lange, G-M (eds) *Wealth Accounting and the Valuation of Ecosystem Services Partnership* (WAVES), World Bank, Washington, DC.

World Bank (2005) *Where is the Wealth of Nations? Measuring Capital for the 21st Century.* Washington DC.

World Bank (2012) *Hidden Harvest: The Global Contribution of Capture Fisheries.* Washington DC.

Wright, JH, Hill, N, Roe, D, Rowcliffe, JM, Kümpel, N, Day, M, Booker, F and Milner-Gulland, EJ (2015) Reframing the concept of alternative livelihoods *Conserv. Biol.*, 30 (2015), pp. 7–13.

WRM (2016) Protected Areas in the Congo Basin: Failing both people and biodiversity. *WRM Bulletin* no 224. Arthough https://wrm.org.uy/ wp-content/uploads/2016/07/Bulletin224.pdf

WWF (2018) *Living Planet Report – 2018: Aiming Higher*. Grooten, M and Almond, REA (eds) WWF, Gland, Switzerland.

WWF (2020) *Living Planet Report 2020* – *Bending the curve of biodiversity loss.* Almond, REA, Grooten M and Petersen, T (eds) WWF, Gland, Switzerland.
WWF and ILO (2020) NATURE HIRES: How Nature-based Solutions can power a green jobs recovery. Attps://www.ilo.org/wcmsp5/ groups/public/---ed_emp/documents/ publication/wcms_757823.pdf

Zafra-Calvo, N and Moreno-Peñaranda, R (2018) Exploring local people's views on the livelihood impacts of privately versus community managed conservation strategies in the Ruvuma landscape of North Mozambique-South Tanzania. *Journal Of Environmental Management*, 206, 853–862. doi: 10.1016/j.jenvman.2017.11.065 do nature-based interventions deliver local development outcomes?

ANNEX A: CASE STUDIES OF GOOD PRACTICE

INTERVENTION TYPE	PROTECTION
Country	The Philippines
Intervention Description	 The Apo Island Marine Reserve Established since 1986, national protection since 1994 Co-managed by the national government and elected community members Tourism activities operated inside the reserve.
Development Outcomes	Food security : increased fish catch due to spillover effect from the reserve; increased nutrition from fish and income to purchase more food variety; fewer fishing hours needed. Health : improved physical health from increased nutrition; increased access to healthcare from fish and tourism income.
	Local economies : increased income from fish sales and tourism operations; job creation from tourism and reserve guards.
	Basic needs, education : investments available for new schools, parents can afford to send children to school both in terms of money and time.
	Conflict : slight increase in within-community conflict over reserve management decisions; on the other hand, community as a whole is more united.
	Empowerment : increased community meeting participation; women can take on new jobs in the reserve and have a stronger voice in the community.
Other outcomes	Poverty reduction documented
Reference	Leisher et al. (2007)

INTERVENTION TYPE	RESTORATION
Country	Mozambique
Intervention Description	 Mangrove restoration initiated by the Centre for Sustainable Development of Coastal Zones and local communities of the Limpopo river
	- Mangrove forest-connecting water channels restored
	 Reforestation: mangrove trees cultivated in local nursery; community members paid to plant the trees
	 Fish and honey harvested from mangroves as an alternative to tree cutting and livestock grazing to conserve the reforested areas.
Development Outcomes	Local economies, short term : income generated from planting trees. Long term: new jobs created to upkeep and monitor reforested areas.
	Climate change adaptation: reduce destruction and impact from coastal flooding.
	Food security : restored habitat to support fisheries, leading to increases in shrimp, crabs, and fish.
Other outcomes	Ecological recovery of the area: 100 hectares of mangrove have been restored and several fish species have returned
Reference	Mwangi and Evans (2018)

INVESTING IN NATURE FOR DEVELOPMENT: do nature-based interventions deliver local development outcomes?

INTERVENTION TYPE	MANAGEMENT
Country	Nepal
Intervention Description	 Community Forest (CF) management in the rural Panchase Mountain Ecological Region for the management of forest ecosystem goods and services (EGS) Major activities include: formation of CF user groups to manage forest EGS; use of forest products and other ecosystem services from the forest; investment of earning from community forest in forest management, poverty alleviation and community development activities; coordination with other community-based organisations.
Development	Local economies: earnings from forest products.
Outcomes	Basic needs: earnings invested into road construction and maintenance of school buildings.
	Food security: increased on-farm food production by strengthening forest-farm links.
	Climate change adaptation : increased diversity of forest EGS provides options for adapting to adverse climate impacts.
	Water security: created water resources and improved water quality.
	Empowerment : developed robust institutional mechanism with authority to manage forest at the local level.
Other outcomes	Poverty alleviation from increased income Increased forest cover and condition
Reference	Adaptation to Climate Change in Panchase Mountain Ecological Regions of Nepal

INTERVENTION TYPE	HABITAT CREATION
Country	Bangladesh
Intervention Description	- Construction of three oyster 'breakwater' reefs on an intertidal mudflat on Kutubdia Island that was unprotected, exposed to tidal flooding and erosion
6 .2	 Concrete rings were placed in the water to act as a substrate for natural oyster recruitment and reef formation; colonised also by other marine organisms such as barnacles, sea anemones, gastropods and polychaetes.
Development Outcomes	Climate change adaptation and disaster risk reduction : contribute to reducing vulnerability of communities to coastal erosion and sea-level rise through multiple mechanisms. Dissipate wave energy and act as breakwaters for tidal water levels; reduces erosion and increases sediment accretion behind the reef and facilitates expansion of salt marshes on the seaward side of the reef.
Other outcomes	Ecological outcomes: facilitates the expansion of salt marshes, an ecologically important habitat in the region and provides suitable living conditions for many other marine organisms



Chowdhury et al. (2019)

INVESTING IN NATURE FOR DEVELOPMENT: do nature-based interventions deliver local development outcomes?

INTERVENTION TYPE	NATURE-BASED FOOD PRODUCTION
Country	Malawi
Intervention Description	 Malawi Farmer-to-Farmer Agroecology Farmers are given training in agro-ecological principles and then supported to experiment with a variety of techniques of their choice such as including growing edible legume intercrops, diversifying their cropping system with additional crops such as sorghum and finger millet (indigenous varieties that are being re-introduced), sweet potatoes or cowpea, adding compost manure or legume residue to their soils, mulching, and growing local landrace varieties of maize Sorghum and finger millet are indigenous grain varieties that have been lost in the regions, re-introduced for their drought tolerance; the local maize landrace is also drought tolerant Agroforestry is also being experimented with, introducing different tree species onto crop fields Farmer-to-farmer educational approach: nominated community representatives selected to receive training and then share knowledge with the rest of the community.
Development Outcomes	Food security : improved soil fertility leading to improved maize yields; reduced need for external inputs has increased food sovereignty; increased nutrition as indicated by increased dietary diversity; local maize landrace provides excellent source of vitamin A to combat vitamin A deficiencies common in the region.
	Health: decreased vitamin A deficiencies.
	Local economies : use of nitrogen-fixing legumes replaced need to purchase chemical fertilisers and legumes can be sold as additional source of income; seed-sharing networks replace need to buy expensive hybrid seeds each year.
	Empowerment, rights and equality : improved household gender relations — greater participation of women in decision making, men taking on more household chores; improved cohesion and social relations at the community level; capacity building by means of training communities in agro-ecological techniques.
	Climate change adaptation, disaster risk reduction and food security : practices retain soil moisture, essential for facing droughts and erratic rainfall; indigenous varieties and local landraces are drought tolerant, providing greater climate resilience.
Other outcomes	
Reference	FAO (2016)

INVESTING IN NATURE FOR DEVELOPMENT: do nature-based interventions deliver local development outcomes?

INTERVENTION TYPE	MANAGEMENT AND PROTECTION
Country	Ethiopia
Intervention Description	 Community forest management and governance in Tehulederi District, as an alternative to state-governed forests
	 Protection is enforced by villagers through participation and sanctions and is reinforced by customary rules, through the involvement of village elders
	 Tree harvesting either for private or community development activities and social services and controlled grazing during extended drought periods permitted.
Development Outcomes	Water security: water has been conserved as a result of the forest protection and management, valued by villagers as one of its most important benefits.
	Food security: branches and leaves are sources of livestock fodder.
	Local economies: salaried jobs are provided to guard the forest.
	Health: forests are sources of medicinal plants.
	Energy security: access to fuelwood.
	Basic needs: access to timber used for building materials.
	Climate change adaptation, disaster risk reduction and food security: forests can be grazed during extended droughts.
	Climate change adaptation, disaster risk reduction and local economies: forests are valued as a source of income during extended droughts and hardship.
	Empowerment, rights and equality: communities have been given control and ownership of their forests
Other outcomes	Ecological outcomes: reversed environmental degradation and wildlife habitat
Reference	Woldie and Tadesse (2019)

INTERVENTION TYPE	PROTECTION, RESTORATION AND MANAGEMENT
Country	Kenya, Burkina Faso
Intervention Description	 Dryland livestock wildlife environment interface project to improve livelihoods and wildlife conservation in degraded savannah ecosystems
	- Establishment of mixed wildlife livestock-based livelihood system
	 Activities include land rehabilitation actions by re-seeding degraded lands, promoting community conservation projects (eg wildlife conservancies) that can support ecotourism, and implementing sustainable grazing and natural resource management within conservation areas; protected community hunting areas can also be leased to private concessionaires.
Development Outcomes	Local economies : ecotourism operations provide jobs and income; income from leasing community hunting areas; increased income from livestock sales.
	Conflict and security, food security and local economies : decreased losses of livestock to wildlife through securing transhumance routes and creating conflict resolution plans.
	Conflict and security, health : decreased incidents of human conflict with wildlife; decreased incidents of conflict between herders and farmers.
	Empowerment, rights and equality : trainings in community game ranger scouts; development of the capacity of the community to undertake sustainable land management through trainings; women empowerment (eg increased business skills); youth empowerment (eg through capacity building, training them in surveillance and monitoring activities).
Other outcomes	Ecological outcomes: land rehabilitation has been successful with improvements shown from increased ecological benefits (eg improved grazing resources)
Reference	The Dryland Livestock Wildlife Environment Interface Project: Experience and Lessons from Livestock-Wildlife-Environment Interface Management in Kenya and Burkina Faso

INVESTING IN NATURE FOR DEVELOPMENT:

do nature-based interventions deliver local development outcomes?

COMBINING NATURE-BASED FOOD PRODUCTION WITH INTERVENTION **OTHER NATURE-BASED INTERVENTIONS** TYPE Country **FI Salvador** Intervention Land and seascape rehabilitation for livelihood improvements implemented by a local, Description community-based development organisation in the Estero de Jaltepeque region Mangrove restoration and reforestation of the banks along the Jalponga river Increased ecotourism capacity and infrastructure -Development of sustainable artisanal fishing practices and agroforestry. -**Development** Local economies: increased income from artisanal fishing and ecotourism operations. Outcomes Health and food security: improvements as a result of diversified food sources. Basic needs: extra income generated has been re-invested in local infrastructure development and education. Empowerment, rights and equality: capacity building in reforestation and sustainable agriculture; supported a 'learning by doing approach' that increased self-esteem and increased social fabric of community. Other outcomes Ecological outcomes: successful reclamation of 40 ha of mangrove forest; recovery and maintenance of fish, shell, shrimp, and crab species Reference UNDP (2018) COMBINATION OF NATURE-BASED FOOD PRODUCTION INTERVENTION TYPE AND OTHER NATURE-BASED INTERVENTIONS Country Mongolia Intervention Landscape-level ecosystem-based adaptation (EbA) approach to enhance and maintain Description ecological integrity and water security under growing threat of climate change in two rural water catchments Replant native species to restore riparian and wetland areas, upstream reforestation, spring rehabilitation Expand protected areas and ensure protection of upstream areas through fencing and inhibiting damaging activities Sustainable pastureland management: decreased herd size and rotational grazing Capacity building within local governments to support the project Support establishment of River Basin Councils for activity coordination. Development Food security: perceived improved pastureland productivity. Outcomes Water security: improvements in water quality by reducing suspended solids in major rivers and perceived increased water availability. Empowerment, rights and equality: capacity building in locals through training on adaptation techniques; in local government institutions to integrate EbA into policy. Climate change adaptation and disaster risk reduction: improvements in food and water security contribute to CCA and DRR as both were threatened by droughts, increased temperatures, and irregular rainfall patterns. Other outcomes Ecological outcomes: native vegetation in riparian and wetland areas restored; improved status of targeted ecosystems; return of indicator species such as migratory birds Reference USAID (2017)

ANNEX B: RESEARCH METHODOLOGY

Literature selected as evidence for the review

We analysed academic journal literature collated by two pre-existing processes:

- 1 Nature-based Solutions Initiative (NbSI): We used literature identified through a systematic mapping exercise recently completed by NbSI (Chausson, Turner et al., 2020), which used Web of Science and Scopus to identify studies on the effectiveness of nature-based solutions for adapting to climate change published up until April 2018. Adaptation to climate change is a development outcome in its own right but many of these studies also reported on other aspects of development including how interventions contributed to local jobs or supported the empowerment of marginalised people. Please see Chausson, Turner et al. (2020) for full details of the methodology for identifying the literature included in this dataset.
- Poverty and Conservation Learning Group (PCLG): PCLG has been screening academic journals and collating lists of articles describing conservation-development linkages on a regular basis since 2012 (the full list of studies can be found via the PCLG Digest archives available at
 www.povertyandconservation.info/ en/pages/newsletters.

For both datasets we used a set of selection criteria (outlined below) to select relevant studies for this review, screening at the title, abstract, and full text stages

To supplement these two existing datasets we conducted two additional searches:

• We re-ran the search conducted in Chausson, Turner et al. (2020) in order to update the dataset with studies published since April 2018.

We conducted a targeted search of the websites of a number of conservation and/ or development organisations to capture non-academic literature. These included:

- Conservation/natural resource management organisations: IUCN (including the 'PANORAMA' database www.iucn.org/resources/ conservation-tools/panorama), WWF, the Wildlife Conservation Society, the Rainforest Foundation, Fauna & Flora International, Rare, TRAFFIC, The Nature Conservancy.
- **UN agencies**: the Convention on Biological Diversity, the Food and Agriculture Organization, the United Nations Development Programme (including the Equator Initiative), the United Nations Environment Program, the Global Environment Facility, the UN-REDD Program.
- CGIAR Research Centres: WorldFish, Bioversity International, CIAT, CIFOR.
- **Development assistance agencies:** DFID (UK Department for International Development), Norad (Norwegian Agency for Development Cooperation), Sida (Swedish International Development Cooperation Agency), GIZ (German Corporation for International Cooperation), USAID (United States Agency for International Development), BMZ (German Federal Ministry for Economic Cooperation and Development), BMU (German Federal Ministry for the Environment), Climate Investment Funds.

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Act4Africa, Action Against Hunger, Action Aid, British Red Cross, Care International, Concern Worldwide, Fairtrade Foundation, IIED, Islamic Relief UK, L'Arche International, ONE against poverty UK, Oxfam, Plan International, Relief International, Save the Children, Tree Aid, UNICEF UK, Water Aid (drawn from the membership of BOND – a UK network of organisations working in international development).

The search consisted of looking through each of these organisations' websites, and screening project lists, case studies, and so on. Search methods varied depending on the 'set up' of individual websites. When possible, all the publication titles that could be found were screened. Other times, specific search terms were used. Search terms could include concepts such as: 'livelihoods', 'food security', 'poverty alleviation', 'agroforestry', 'agroecology', 'protected areas', 'wildlife management', 'forest management', with the specific terms varying depending on the type of organisation and website being searched. However, search terms varied depending on the specific organisation that was being looked at.

As with the academic literature, publications were screened first by title, then by summaries and/or tables of contents and then by full text.

Study selection criteria

For all the sources of evidence collected for this review we used the following criteria to identify relevant studies.

Inclusion criteria:

 Studies report evidence of how an investment in nature (ie an intervention that meets the criteria of one or more of our five intervention categories – see report for definitions of each category) has affected at least one of the following development outcomes: food security, water security, local economies (jobs, income), health, energy security, other basic needs, climate change adaptation, disaster risk reduction, social cohesion and security, and rights, empowerment and/or equality.

- Investment occurs in low- or lowermiddle-income countries (World Bank, 2020).
- Study takes place between 2010 and 2020.

Exclusion criteria:

- Investments in upper-middle or high income countries
- Studies published before 2010
- Non-original research: method papers, perspectives, opinion pieces and reviews
- No mention of an investment in nature
- No report of any development outcomes associated with an investment in nature
- Investments in urban environments (note: interventions in peri-urban areas were included)

Coding framework

We developed a coding framework (an Excel worksheet including the framework is available on request) to categorize the evidence for all reported intervention cases in a study according to:

- Bibliographic meta-data
- Basic information about the intervention (including geographical region, habitat type, type of intervention)
- Intervention design and implementation (including instigators of the intervention, involvement of local communities, target of intervention)

- Provide a sequence of the outcomes (ten categories), the direction of effect, the scale of the outcome (spatial, temporal), as well as equity dimensions (for whom), and whether or not economic (monetised) effects were reported.
- Linkages between different development outcomes
- Reported effects on poverty status, ecological outcomes, and climate change mitigation outcomes
- Study methodology information (incl. type of data and method of data collection)

To test consistency in coding, 20 studies across peer-reviewed and grey literature were coded by three individuals. Coding definitions were revised during the process to ensure all coders were interpreting each question in the same way. Coders were in communication throughout the process and discussed and resolved coding queries that were encountered.

For the PCLG dataset, a reduced coding framework was used due to time constraints and the large number of studies within the dataset. This framework does not capture the direction of effect of reported outcomes, linkage between outcomes, and study methodology.

Limitations

Given the scope of the research question, our analysis relies on existing databases — a novel comprehensive search of the academic journal literature was not feasible given resource and time constraints. As such we do not capture academic journal studies on the development benefits of investments in nature which did not span the scope of conservation and wellbeing (PCLG dataset), or the effects of nature-based interventions for climate change adaptation (NbSI dataset).

The NbSI dataset also excluded nature-based food production so all evidence from these interventions was derived only from the grey literature and PCLG dataset.

References

Chausson, A, Turner, B, Seddon, D, Chabaneix, N, Girardin, C, Kapos, V, Key, I, Roe, D, Smith, A, Woroniecki, S and Seddon, N (2020) Mapping the effectiveness of nature-based solutions for climate change adaptation. *Global Change Biology* 26(11), 6134–6155.

World Bank (2020) *Country and lending groups*. https://datahelpdesk.worldbank.org/ knowledgebase/articles/906519-world-bankcountry-and-lending-groups

ANNEX C: LIST OF ACRONYMS AND ABBREVIATIONS

CBD	Convention on Biological Diversity
CGIAR	Consultative Group for International Agricultural Research
СОР	Conference of the Parties
DRR	Disaster risk reduction
EbA	Ecosystem-based adaptation
GBF	Global Biodiversity Framework
GDP	Gross domestic product
ILO	International Labour Organization
IPBES	Intergovernmental Science Policy Platform on Biodiversity and Ecosystem Services
IPCC	Intergovernmental Panel on Climate Change
IUCN	International Union for the Conservation of Nature
NbS	Nature-based solutions
NbSI	Nature-based Solutions Initiative
NGO	Non-governmental organisation
OECD	Organisation for Economic Cooperation and Development
PA	Protected area
PES	Payment for ecosystem services
REDD	Reducing emissions from deforestation and forest degradation
REDD+	Reducing emissions from deforestation, reducing emissions from forest degradation,
	conservation of forest carbon stocks, sustainable management of forests, and
	enhancement of forest carbon stocks
SDGs	Sustainable Development Goals
UN	United Nations
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organisation
UNFCCC	United Nations Framework Convention on Climate Change
WWF	World Wildlife Fund



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