BUILDING ON NATURE

CITATION
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CORRESPONDING AUTHORS
Nigel Dudley (nigel@equilibriumresearch.com) and Marianne Kettunen (mkettunen@ieep.eu)

PARTNERS
Institute for European Environmental Policy (IEEP)
IUCN World Commission on Protected Areas (WCPA)
The Nature Conservancy (TNC)
The World Bank Group
UN Development Programme (UNDP)
Wildlife Conservation Society (WCS)
WWF

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INSTITUTE FOR EUROPEAN ENVIRONMENTAL POLICY (IEEP)

IEEP Main Office
Rue Joseph II 36-38
1000 Bruxelles, Belgium
Tel: +32 (0) 2738 7482
Fax: +32 (0) 2732 4004

London Office
25EP, 25 Eccleston Place
Belgravia SW1W 9NF London, the UK
Tel: + 44 (0)204 524 9900
@IEEP_eu

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BUILDING ON NATURE

Area-based conservation
as a key tool for
delivering SDGs

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Executive summary

Executive summary

Effective area-based conservation – protected areas, other effective area-based conservation measures (OECMs) and similar management strategies – can help to address many of the Sustainable Development Goals (SDGs).

People are fundamentally dependent on nature's contribution for a wide range of services that are essential to maintaining human wellbeing. Area-based conservation helps ensure these irreplaceable services now and into the future. SDGs seek to encapsulate a pathway to a more equitable future, free from hunger, resources shortages and environmental degradation, and with sufficient space for all living things.

This report identifies myriad ways in which effective area-based conservation can be a pro-active tool for delivering SDGs. Furthermore, the guidance documents 30 detailed case studies that illustrate the links between protected and conserved areas and various SDGs that are already in practice around the world. Finally, it provides guidance and tools explaining how governments, industry and civil society can integrate protected and conserved areas into their SDG strategies and reporting processes.

Area-based conservation: Area-based conservation includes protected areas as recognised by IUCN and the UN Convention on Biological Diversity (CBD) and "Other Effective Area-Based Conservation Measures" (OECMs), a new designation of areas that conserve biodiversity without necessarily having this as a primary aim. In this report we also consider a variety of other area-based approaches to conservation that often complement the above, such as conservation corridors or buffer zones, which, depending on their scope, may or may not fall into these two more formal designations. We use the term "*protected and conserved areas*" to capture the whole array of the above approaches.

While many protected and conserved areas are managed by states, they are increasingly also established by Indigenous people, local communities, private individuals, trusts, companies and religious bodies, often on land and water that has been under traditional management for centuries. We use the phrase "effective area-based conservation" repeatedly in the text, to emphasise the importance of effective management and implementation as a prerequisite for protected and conserved areas to deliver both biodiversity and wider sustainability benefits.

Finally, area-based conservation is supported by a range of tools and approaches such as Payment for Ecosystem Services schemes (PES), systematic conservation planning and restoration. Given these complementarities, especially when delivering SDGs, we also highlight some of these in the report.

The Sustainable Development Goals: 17 goals for 2030, set by the United Nations in 2015, ranging from poverty reduction, through environmental protection to peace, justice and strong institutions. Although individual SDGs have been criticised, they represent a unique global attempt to address a wide range of critical social and environmental issues in an interconnected manner. However, countries are facing considerable challenges in delivering the SDGs. Most SDGs are not on track to meet their targets by 2030 and, in particular, natural ecosystems and species are continuing to decline – in some cases (e.g. natural forests) losses have increased since the SDGs were agreed. Consequently, there is an urgent need to find ways to accelerate progress towards achieving the goals.

We hope to help anyone involved in designation or management of protected and conserved areas to understand and benefit from the wider values of their sites for sustainable development. But perhaps even more importantly, we are reaching out to other stakeholders who may be involved in activities far removed from conservation, with the message that setting aside natural areas of land, freshwater or marine habitats is a critical component of any sustainable development policy.

A call for action

Protected and conserved areas have a key role to play in the delivery of a wide range of the SDGs, in addition to those explicitly linked to biodiversity conservation.

Therefore, we encourage governments and others to draw on the benefits derived from these approaches when implementing and reporting progress on the SDGs. Full use of these as a tool for SDG delivery includes four key steps:

- **Recognition** of wider SDG targets addressed by protected and conserved areas, including clear valuation, measuring benefits and maximising wider benefits. Effective area-based conservation can contribute in some measure to virtually all the SDGs but we identify the strongest links.
- **Integration** of ecosystem services into site-level policies and national SDG strategies. Planning is needed to maximise benefits and avoid perverse results, such as supplying SDGs at the expense of core conservation values (SDGs 14 and 15).
- **Enhancement** of the relevant values through management approaches, if possible, both by increasing the area under conservation management, and by increasing the number and/or value of ecosystem services within these areas.
- **Reporting** of these as a contribution to the SDGs is very important in terms of building support for effective area-based conservation.

We also call on existing international processes, including the CBD, United Nations Convention to Combat Desertification (UNCCD) and United Nations Framework Convention on Climate Change (UNFCCC) along with UN agencies and bilateral and multilateral donors, to give more explicit recognition of the significance of effective area-based conservation in their reporting mechanisms and policies. Clear analytical and reporting guidelines are given in Part C.

Contribution of effective area-based conservation to SDGs

While area-based conservation can contribute to the delivery of most SDGs, this report focuses on showcasing those SDGs known to have the most direct links with protected and conserved areas, including an unequivocal evidence base supporting their role in delivering the objectives. Using these SDGs as an entry point, the guidance highlights how the benefits cascade across a broad set of SDGs.

The approach to outlining the key SDGs builds on the understanding of the hierarchical interconnectedness between the SDGs. We start with SDGs 14 and 15 protecting life below water and on land that can be considered to form the *cornerstones of conservation, underpinning all prosperity*. We then move on to SDGs 2, 6 and 13 linked to food, water and climate security that provide the *fundamentals to our wellbeing*, directly building on the valuable functions that nature performs. Finally, we focus on SDGs 1, 3, 5, 10, 11 and 16 that are responsible for our *sustainable and healthy societies*, all of which benefit from resilient and well-functioning ecosystems, one way or another.

Cornerstones of conservation and underpinnings of prosperity

SDG 15 – Life on land

Effective area-based conservation remains the single most powerful tool to conserve biodiversity. Many species, and the integrity of many ecosystems, only survive through this mechanism. Recognition of new approaches such as OECMs, and growing cooperation with many Indigenous people, massively increases the potential of using effective area-based conservation to deliver SDG 15.

Some important approaches for SDG 15

- **Protected areas**
  - ✓ Protected areas in mainly natural landscapes (IUCN Categories I-III, VI)
  - ✓ Protected areas in mainly cultural or modified landscapes (IUCN Categories IV-V)
  - ✓ ICCAs and Indigenous Protected Areas
- **OECMs**
- **Key complementary approaches**
  - ✓ Connectivity corridors (can be protected areas, OECMs or neither)
  - ✓ Climate refugia (can be protected areas, OECMs or neither)

SDG 14 – Life below water

Marine protected areas and OECMs play a critical role in delivering the biodiversity elements of SDG 14; other spatially defined approaches can also contribute to biodiversity conservation and to other targets within this Goal.

Some important approaches for SDG 14

- **Protected areas**
  - ✓ Marine protected areas
- **OECMs**
  - ✓ Marine OECMs
  - **Locally Managed Marine Areas** (can be protected areas, OECMs or neither)
- **Key complementary approaches**
  - ✓ Fishery spatial protection measures – not usually protected areas or OECMs
  - ✓ Particularly sensitive sea areas – not usually protected areas or OECMs

Fundamentals for wellbeing

SDG 2 – Zero hunger

The emphasis is on maintaining sustainable populations of harvested species, protecting genetic diversity needed for crop and livestock breeding, supplying ecosystem services needed by agriculture and maintaining traditional farming with important associated biodiversity:

- Maintaining populations of species collected from the wild, particularly fish
- Conserving crop and livestock wild relatives needed for breeding programmes
- Conserving wild species supportive of agriculture such as pollinators
- Supplying ecosystem services such as water for irrigation
- Stabilising and rebuilding soil and associated beneficial soil organisms
- Encouraging traditional agriculture and grazing with important associated biodiversity

Some important approaches for SDG 2

- **Protected areas**
  - ✓ Terrestrial protected areas maintaining water and climate services for agriculture
  - ✓ Micro-reserves for crop wild relatives
  - ✓ Category V protected areas maintaining traditional farming methods as part of wider conservation strategies
  - ✓ Protected areas incorporating pastoralism and sustainable grazing
  - ✓ Marine and freshwater protected areas
- **OECMs**
  - ✓ Terrestrial OECMs incorporating compatible agricultural practices that support high levels of biodiversity, such as grassland with low grazing pressure
  - ✓ Marine OECMs important as recruitment areas for marine biodiversity and fish stocks with limited levels of local, small-scale fish harvesting
- **Locally Managed Marine Areas** (can be protected areas, OECMs or neither)

SDG 6 – Clean water and sanitation

Improving both the quantity and particularly the quality of water through natural ecological processes and ensuring a regular flow of water:

- Improving the quality of water flowing out of catchments, through natural filtering services
- Increasing the quantity of water available in the case of some ecosystems, particularly tropical mountain cloud forests and Andean paramos vegetation
- Storing water in soils and vegetation to regulate water supply

Some important approaches for SDG 6

- **Protected areas**
  - ✓ IUCN category I-IV and category VI protected areas
- **OECMs**
  - ✓ Watershed protection areas
  - ✓ Wetland areas with important biodiversity values (such as important sites for migratory birds)
- **Key complementary approaches**
  - ✓ Reduced grazing regimes with conservation goals
  - ✓ Riparian zones with conservation management important as ecological corridors
  - ✓ Systematic conservation planning (need for whole watershed approach)
  - ✓ Payment for ecosystem services (because PES is particularly suited to water services)
  - ✓ Ecological restoration strategies

SDG 13 – Climate action

Here particularly storing and sequestering carbon and providing natural defences against extreme weather events, but also wider ecosystem service provision:

- Storing and sequestering carbon in forests, grasslands, peatlands, ocean ecosystems and in managed ecosystems within protected landscapes
- Providing disaster risk reduction (DRR) through natural barriers and other processes
- Maintaining other ecosystem services to help humanity build resilience and adapt to climate-related changes
- Demonstrating impacts of climate change, for instance, as monitoring sites through showing rate of glacier retreat

Some important approaches for SDG13

- **Protected areas**
  - ✓ Carbon storage in protected areas
  - ✓ Disaster risk reduction supported by protected areas
- **OECMs**
  - ✓ Carbon storage in OECMs
  - ✓ Disaster risk reduction supported by OECMs
- **Key complementary approaches**
  - ✓ Climate refugia (can be protected areas, OECMs or neither)
  - ✓ Payment for Ecosystem Services including REDD+ and other voluntary schemes
  - ✓ Restoration

Sustainable and healthy societies

SDG 1 – No poverty

Protected and conserved areas often provide economic opportunities to poor people in places where there are few other options:

- Tourism and ecotourism
- Direct and indirect employment
- Collection and sale of wild products
- Sustainable agriculture, grazing and agroforestry
- Maintenance of ecosystem services through Payment for Ecosystem Services (PES), including REDD+ and similar

Some important approaches for SDG 1

- **Protected areas**
  - ✓ IUCN Category II, III and V protected areas, privately protected areas and ICCAs involved in ecotourism
  - ✓ IUCN Category VI protected areas used in the collection of wild products
  - ✓ IUCN Category V protected areas for sustainable agriculture
- **OECMs**
  - ✓ Areas of high biodiversity value which include agriculture (e.g. some forms of traditional agriculture, some organic farming), wild food collection, medicinal plants, etc.
  - ✓ Areas of high biodiversity value which may have economic values associated (e.g. ecotourism)

SDG 3 – Good health and wellbeing

Both direct impacts on mental and physical health through exercise and relaxation, plus supply of medicines and management of ecosystems to minimise disease transmission and crossover:

- Supporting both physical and mental aspects of health through access to nature
- Conserving natural ecosystems as significant sources of both local medicines and the raw materials for commercial pharmaceuticals, which are often rare or absent in other places
- Slowing the transmission of some vector-borne diseases by maintaining unfragmented ecosystems
- Reducing the risks of zoonotic diseases passing from animals to humans through managing intact ecosystems
- Improving water and air quality and mitigating heat stress and air pollution in urban areas

Some important approaches for SDG 3

- **Protected areas**
  - ✓ Urban protected areas
  - ✓ Protected areas adjacent to towns and cities
  - ✓ Protected areas supporting community health and medicines
  - ✓ Protected areas supplying raw materials for pharmaceuticals
- **OECMs**
  - ✓ Urban parks and other natural habitats in urban areas if they are important for biodiversity
- **Key complementary approaches**
  - ✓ Corridors (protected areas, OECMs or neither)

SDG 10 and SDG 5 – Reduced inequalities, including improving gender equality

Reducing inequality including gender inequality: addressing issues of social exclusion, inequality including gender inequality through attitudes to selection and management of protected and conserved areas:

- Promoting social inclusion, particularly for ethnic or religious minorities, women and youth
- Ensuring equal opportunities in employment directly within a protected area or OECM, or through support of associated businesses
- Making sure that access to wider benefits preferentially benefits the disadvantaged in society

Some important approaches for SDG 10 and 5

Responses here are less about specific types of protected and conserved areas and more about ensuring that management sets and demonstrates good practice relating to issues of participatory planning and management, sound governance and recognition of the rights of people to steward lands and waters, with tools such as codes of conduct and benefit-sharing schemes being important support mechanisms.

SDG 11 – Sustainable cities and communities

Helping to provide decent and safe living conditions in cities by purifying air and water and through disaster risk reduction, plus maintaining important wild spaces in cities and smaller communities:

- Providing disaster risk reduction through intact natural ecosystems, including coastal protection, soil stabilisation to prevent dust storms, protection of steep slopes and reducing flood risk
- Ensuring water reaching cities is high quality and of sufficient quantity
- Improving air quality through carefully planned vegetation and retention of semi-wild parks and gardens
- Managing, expanding and to some extent rewilding green spaces in cities
- Providing sustainable livelihoods for communities through tourism, etc.
- Maintaining or restoring connectivity to maximise benefits for both biodiversity and people

Some important approaches for SDG 11

- **Protected areas**
  - ✓ Urban reserves
  - ✓ Protected areas adjacent to towns and cities
  - ✓ World Heritage sites (an explicit target in this SDG)
- **OECMs**
  - ✓ Urban parks and other urban areas if they are important for biodiversity and if they qualify as OECMs (most will not)
  - ✓ Community conserved areas
- **Key complementary approaches**
  - ✓ Corridors (may be protected areas, or OECMs, or neither)

SDG 16 – Peace, justice and strong institutions

Helping to reduce risks of conflict through resource scarcity, providing a neutral forum for conflict mitigation and resolution and supporting post-conflict peace building:

- Maintaining ecosystem functions and related benefits (e.g. food, fuel, water, natural medicines), to minimise risks of conflicts during periods of unrest and/or resource scarcity
- Helping mitigation and resolution by contributing to basic human wellbeing (e.g. sources for livelihood) and using protected area frameworks to retain a certain level of governance and cooperation in conflict areas
- Increasing social cohesion, bringing back economic opportunities to communities and providing governance structures for the sustainable use of land and resources into the future, as in Peace Parks

Some important approaches for SDG 16

- **Protected areas**
  - ✓ Peace Parks
  - ✓ Transboundary protected areas
- **OECMs**
  - ✓ Some demilitarised zones
  - ✓ Some military training areas

Part A
Setting the scene

1. Objective and approach of the guidance

The objective of this report is to demonstrate the contribution that effective area-based conservation makes in helping to deliver the 2030 Sustainable Development Agenda across different governance models and strategies, with contribution to multiple Sustainable Development Goals.

The guidance will demonstrate in practice how protected areas and other types of effective area-based conservation across the world function as a "multi-delivery approach" for SDGs, by offering numerous benefits to human wellbeing at local to national scale and also by providing an adaptive and inclusive framework for governing natural resources.

Building on the body of evidence from our review and case studies, we call for integrating protected and conserved areas into the mix of transformative approaches delivering the Sustainable Development Goals, both by the conservation community and by wider communities responsible for delivering the 2030 Agenda. Achieving many of the SDGs by 2030 will be difficult or impossible without taking far greater account of the role and contributions of secure natural ecosystems.

Research shows that many companies take the SDGs seriously, but have struggled to find meaningful ways to engage. Analysis of 729 companies by PwC in 2018[1] found 72 per cent mentioned the SDGs in their corporate or sustainability reports but only 2 per cent had identified meaningful indicators or targets. Support for effective area-based conservation, particularly for those companies drawing direct benefits from such places, would be an obvious way to respond positively to the challenge laid down by the SDGs.

The text has been developed together with a wide community of partners, representing both the conservation and wider sustainable development communities and with ample experience in successfully delivering effective area-based conservation activities on the ground. The case studies included draw from this experience, showing beyond doubt that a joint delivery of conservation and wider sustainability benefits is achievable in practice.

While area-based conservation can contribute to the delivery of most SDGs, this report focuses on showcasing those SDGs known to have the most direct links with protected and conserved areas, including an unequivocal evidence base supporting their role in delivering the objectives. Using these SDGs as an entry point, we systematically highlight how benefits associated with effective area-based conservation cascade across a broad set of SDGs. The report consists of the following:

- **Part A**: An introduction and an overview of the status of natural capital and progress in sustainable development to date.
- **Part B**: SDG specific evidence and guidance on the role of effective area-based conservation in supporting their delivery, supported by a number of concrete case studies around the world.
- **Part C**: A call for action at different governance levels by both conservation and wider sustainable development communities.

2. Introduction

2.1 What is effective area-based conservation?

With the loss of biodiversity continuing, there is growing concern that the world cannot afford greater loss and degradation of natural ecosystems, and that a combination of different conservation models – including protected areas and other effective area-based conservation measures – is needed,[2] covering up to half the planet,[3] focusing on places with high levels of biodiversity.[4] With this realisation, the world of area-based conservation has become much more ambitious, with a significantly larger potential to deliver both conservation and also broader sustainability objectives.

There is no official definition for "effective area-based conservation". However, it is commonly understood to refer to spatially defined areas of land and water managed in ways which deliver long-term nature conservation, along with associated ecosystem services. It is clear that the overall definition is still evolving, quite rapidly. Key definitions are further elaborated below.

Protected areas

Most classically, this refers to protected areas – national parks, nature reserves, and so on – owned and managed by governments, for-profit or non-profit organisations, communities, Indigenous people or private individuals. Over the past two decades, there has been a revolution in our understanding of both the governance and make-up of such areas, resulting in a much more varied set of conservation tools, coupled with far greater ambition about the amount of land and sea that should be involved in conservation.

A protected area, according to IUCN is: "*A clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values*".[5] The definition is clarified by a series of principles, the most relevant here being: "for IUCN, only those areas where the main objective is conserving nature can be considered protected areas; this can include many areas with other goals as well, at the same level, but in the case of conflict, nature conservation will be the priority". Many protected areas will have other management priorities – cultural, spiritual, tourism-related, etc. – but to be a protected area recognised by IUCN, conservation needs to take priority.

The definition is expanded by recognising six management categories, ranging from the strictest forms of protection, with human presence banned or carefully controlled, to protected landscapes and seascapes, where conservation takes place alongside farming, forestry and often also settled human communities. The categories are described in Table 2.1.

In recent years, the importance of protected area governance has also been recognised. Much attention has been given to protected areas managed, and increasingly self-declared, by Indigenous people and local communities, along with community-managed areas, privately protected areas and – a growing trend – areas under shared governance and/or co-management areas with multiple partners involved. In parallel with the management categories, IUCN therefore recognises a range of governance types; describing who holds authority and responsibility for the protected area. See Table 2.2.[6]

No.	Name	Description
Ia	**Strict nature reserve**	Strictly protected areas set aside to protect biodiversity and also possibly geological/ geomorphological features, where human visitation, use and impacts are strictly controlled and limited.
Ib	**Wilderness area**	Usually large unmodified or slightly modified areas, retaining their natural character and influence, without permanent or significant human habitation.
II	**National park**	Large natural or near natural areas conserving large-scale ecological processes, along with characteristic species and ecosystems, which also provide a foundation for environmentally and culturally compatible spiritual, scientific, educational, recreational and visitor opportunities.
III	**Natural monument or feature**	Areas set aside to protect a specific natural monument, which can be a landform, sea mount, submarine cavern, geological feature such as a cave or even a living feature such as an ancient grove.
IV	**Habitat/ species management area**	Areas that aim to protect particular species or habitats and where management reflects this priority. Many will need regular, active interventions to address the requirements of particular species or to maintain habitats.
V	**Protected landscape or seascape**	An area where the interaction of people and nature over time has produced significant ecological, biological, cultural and scenic value: and where safeguarding the integrity of this interaction is vital to protecting and sustaining the area and its associated nature conservation and other values.
VI	**Protected areas with sustainable use of natural resources**	Areas which conserve ecosystems and habitats, together with associated cultural values and traditional natural resource management systems. They are generally large, mostly in a natural condition, where a proportion is under sustainable natural resource management, with low-level non-industrial use of natural resources compatible with nature conservation.

Table 2.1: IUCN protected area categories.

Type	Name	Description
A	**Governance by government**	Federal or national ministry/agency Sub-national ministry/agency Government-delegated management (e.g. to NGO)
B	**Shared governance**	Collaborative management (various degrees of influence) Joint management (pluralist management board) Transboundary management (various levels over frontiers)
C	**Private governance**	By individual owner By non-profit organisations (NGOs, universities, cooperatives) By for-profit organisations (individuals or corporate)
D	**Governance by Indigenous people and local communities**	Indigenous peoples' conserved areas and territories Community conserved areas – declared and run by local communities

Table 2.2: IUCN protected area governance types.

Other effective area-based conservation measures (OECMs):

In 2010, negotiations on the global Aichi Biodiversity Targets under the Convention on Biological Diversity (CBD) led to a broader approach for area-based conservation: "*By 2020, at least 17 per cent of terrestrial and inland water areas and 10 per cent of coastal and marine areas … are conserved through … systems of protected areas* ***and other effective area-based conservation measures***…" (OECMs, our emphasis).[7] To help to define OECMs in practice, IUCN produced guidance and CBD Signatories agreed a definition in 2018: "*A geographically defined area other than a Protected Area, which is governed and managed in ways that achieve positive and sustained long-term outcomes for the in-situ conservation of biodiversity, with associated ecosystem functions and services and where applicable, cultural, spiritual, socio-economic, and other locally relevant values*".[8] OECMs must protect important biodiversity.

This covers three cases:

- **Ancillary conservation** – areas delivering *in-situ* conservation as a by-product of management, even though biodiversity conservation is not an objective (e.g. some military training grounds).
- **Secondary conservation** – active conservation of an area where biodiversity outcomes are only a *secondary* management objective (e.g. some conservation corridors).
- **Primary conservation** – areas meeting the IUCN protected area definition, but where the governance authority (community, Indigenous peoples' group, religious group, private landowner or company) does not wish them to be reported as protected areas.[9]

Recognition of OECMs is new and governments are still considering how they might be recognised and reported although their applicability to the SDGs is already being discussed, for example in reaching SDG 14.5 relating to protection of marine areas.[10]

Other area-based approaches to conservation

Area-based conservation can include other approaches, like connectivity corridors **or ecological corridors**, steppingstones and protected area buffer zones, which may or may not be protected areas or OECMs, but which nevertheless deliver conservation outcomes in the long term through their governance and management. Corridors link remaining natural or semi-natural ecosystems and can provide a direct physical connection or sometimes a convenient stopping off place for species such as birds that may migrate for long distances. **An ecological corridor is** defined by IUCN as "*a clearly defined geographical space that is governed and managed over the long term to maintain or restore effective ecological connectivity*".[11] Buffer zones surround and help to conserve protected areas; they might themselves be natural habitat but used for subsistence or tourism.

The term "protected and conserved areas" is used in the current report to cover this wide range of approaches.

Complementary approaches

Finally, in this report we include some other management tools based around specific place-based approaches that can help deliver effective area-based conservation, are beneficial to biodiversity and are known to play an important role in delivering SDGs. These include tools like Payment for Ecosystem Services (PES), systematic conservation planning and restoration, all of which may or may not be area-based. We also include some complementary approaches linked to sustainable use that, while neither protected or conserved areas, often flank area-based conservation measures, delivering some distinct biodiversity benefits while offering a range of benefits to other SDGs.

2.2 How can effective area-based conservation support the sustainable development goals?

The *2030 Agenda for Sustainable Development*[12] will be the driving force behind much global work on sustainable development and conservation over the next decade, with some targets also linked closely to those of the post-2020 Global Biodiversity Framework. Central to the *Agenda* are the 17 Sustainable Development Goals (SDGs). Their development marks an important stage in a process of international cooperation on environment and development that began at the Earth Summit in Rio de Janeiro in 1992.[13]

The SDGs are universally applicable but are led through governmental commitments to the sustainable development agenda. Although the content of the SDGs was subject to considerable debate,[14] they are the main goalposts against which global progress will be measured for some time and it is important to align conservation policies as far as possible within their framework.

The goals are captured in Figure 2.1 with progress on these goals outlined in section 3.[15]

Each SDG has an associated set of targets and agreed indicators. The goals are interconnected and frequently interdependent, with sustainable development overall relying on resilient and biodiverse ecosystems that support livelihoods and socio-economic wellbeing (e.g. food production, water availability, climate change mitigation and resilience)[16] (Figure 2.2). This hierarchy rests on generally well-established evidence that healthy and well-functioning ecosystems provide opportunities for addressing critical environmental and social issues, including climate change.[17] The key role that biodiversity plays in the delivery of many of the SDGs has been analysed and collated.[18]

Conservationists in restored grassland, S. Africa.

1. No Poverty

End poverty in all its forms everywhere.

2. Zero Hunger

End hunger, achieve food security and improved nutrition and promote sustainable agriculture.

3. Good Health and Wellbeing

Ensure healthy lives and promote wellbeing for all at all ages.

4. Quality Education

Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

5. Gender Equality:

Achieve gender equality and empower all women and girls.

6. Clean Water and Sanitation

Ensure availability and sustainable management of water and sanitation for all.

7. Affordable and Clean Energy

Ensure access to affordable, reliable, sustainable and modern energy for all.

8. Decent Work and Economic Growth

Promote sustained, inclusive and sustainable economic **growth, full and productive employment and decent work for all.**

9. Industry, Innovation and Infrastructure:

Build resilient infrastructure, promote inclusive and sustainable industrialisation and foster innovation.

10. Reduced Inequality

Reduce inequality within and among countries.

11. Sustainable Cities and Communities

Make cities and human settlements inclusive, safe, resilient and sustainable.

12. Responsible Consumption and Production

Ensure sustainable consumption and production patterns.

13. Climate Action

Take urgent action to combat climate change and its impacts.

14. Life below Water

Conserve and sustainably use the oceans, seas and marine resources for sustainable development.

15. Life on Land

Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss.

16. Peace, Justice and Strong Institutions

Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels.

17. Partnerships to achieve the Sustainable Development Goals

Strengthen the means of implementation and revitalise the global partnership for sustainable development.

Figure 2.1:
Summary of the SDGs

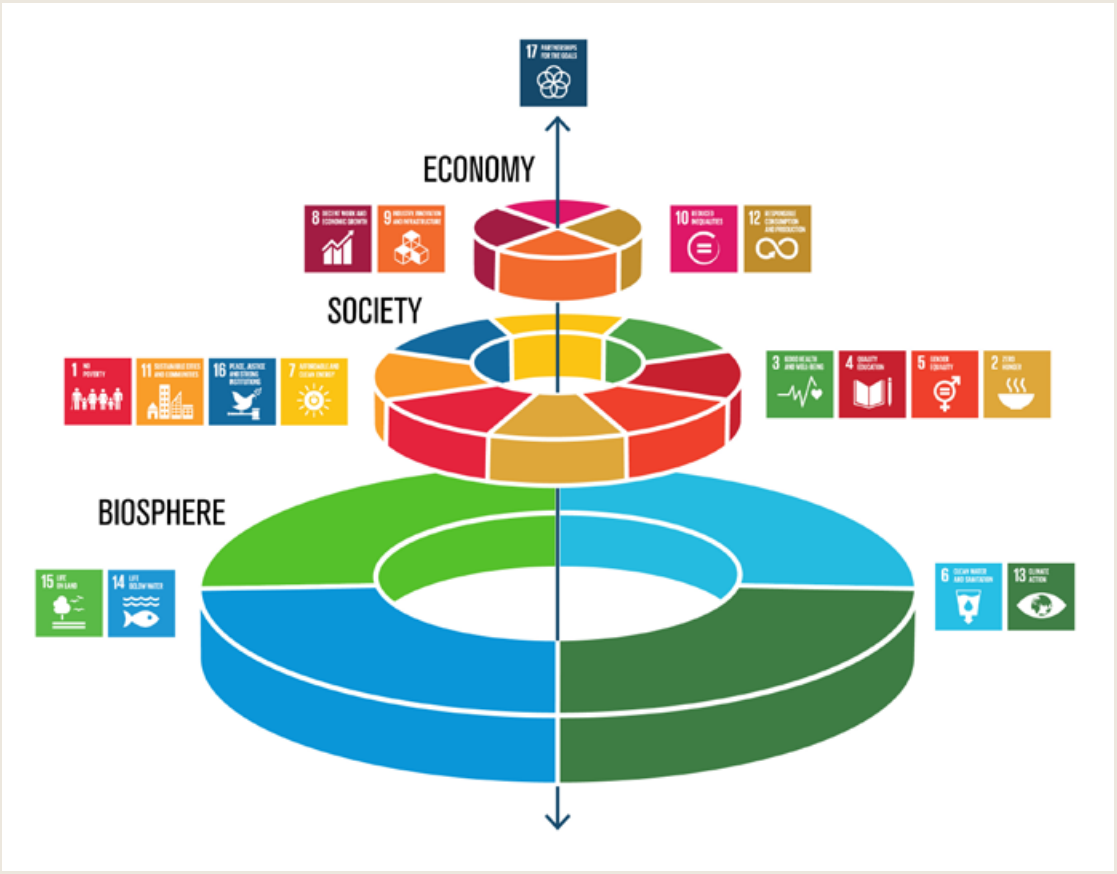

Figure 2.2: Relationship between the various SDGs. Azote Images for Stockholm Resilience Centre, Stockholm University.

It has been estimated that building on the links between biodiversity and ecosystem services can support achieving over 40 of the 169 targets across the majority of SDGs, including both human wellbeing and environmental goals.[19] Well-designed approaches to effective area-based conservation have proven to deliver synergies between multiple SDGs and address trade-offs between SDGs in a sustainable manner, supporting sustainable development beyond SDG 14 and SDG 15.[20, 21, 22]

Central to this is the role that protected areas play in conserving ecosystems and all the associated services that these provide. Additionally, while protected areas and OECMs are not primarily vehicles for social and economic change, they are increasingly expected to pay far more attention to social values, with an increased understanding and emphasis on equitable governance and socio-economic benefits. For instance, many state-owned protected areas in Africa are expected to report on their contribution to broader sustainable development, including poverty alleviation, and are also important vehicles for wildlife tourism and local economic benefits.

At the same time, research shows that investment in ecological infrastructure in South Africa can play a key role in achieving both the national development agenda and the SDGs.[23]

As this report demonstrates, protected and conserved areas help to underpin social and economic resilience, including addressing multiple factors associated with poverty. They support water and food security, including by purifying water, maintaining healthy populations of pollinators, and protecting genetic diversity of cultivated species (SDG 2 and SDG 6). They also help to mitigate different natural hazards, including supporting adaptation to climate change, while often at the same time functioning as carbon storage and sinks (SDG 13).

Support to food, water and climate security contributes to broader human security, with protected and conserved areas regularly playing a key role in securing the availability of natural resources and also more generally supporting peaceful coexistence at local and regional levels (SDG 16). Such areas also play a role in maintaining human health (both physical and mental), creating opportunities

for recreation and tourism, and forming cultural characteristics and values (SDG 3).

Protected and conserved areas also address issues linked to economic wellbeing. They support multiple means of livelihoods (e.g. beyond tourism), contributing to the creation of decent work and sustainable socio-economic growth, in this way helping to reduce poverty directly (SDG 8 and SDG 1). Protected areas provide jobs to rangers and other management staff in the region. They also encourage ecotourism, and maintain a variety of ecosystem services that can support both economic and other benefits to poor communities, particularly in rural areas and places where few other economic alternatives are available.[24] Revenue generated by nature tourism is known to be a significant contributor to the overall local and regional economy. For example, in Finland it has been estimated that the public investment in supporting the network of national parks provides benefits to the local economy in a ratio of 1 to 10.[25]

Building on all the above, effective area-based conservation can be part of the development strategies for sustainable communities and cities (SDG 11), including their approaches to reduce inequalities at local and regional level (SDG 10 and SDG 5). As the case studies show, protected and conserved areas can play a key role in the socio-economic viability of an area. They can be used to help Indigenous people to secure their access to land and resources or to integrate specific goals aimed at addressing gender related inequities in local communities.

There are, therefore, clear links between the SDGs and the wider biodiversity aims of the Convention on Biological Diversity in terms of ecosystem services.[26, 27] However, there are also tensions and trade-offs between meeting some of the social and economic goals while simultaneously ensuring the delivery of the underpinning environmental goals.[28] For example, approaches to achieve zero hunger or economic growth can put further pressures on ecosystems and the environment if their impacts across all SDGs are not considered. Similar tension also exists between addressing climate mitigation and meeting biodiversity conservation objectives, with approaches to combating climate change not being synergetic with nature conservation by default.[29] Furthermore, alongside enthusiasm for using protected and conserved areas as a natural solution for mitigating climate change,[30] there are concerns that this will detract from the urgent need to reduce emissions.[31] Addressing these disparities and identifying integration as a key to achieving the SDGs[32] both remain important priorities.

Seeking synergies between SDGs, including identifying holistic approaches that can deliver multiple SDGs simultaneously, is increasingly recognised as the way forward towards more effective implementation of the 2030 Agenda.[33] Sustainable consumption and production policies have an important role to play here.[34] As biodiversity and well-functioning ecosystems underpin human welfare and socio-economic development, they can also be used as effective entry points for cascading benefits across multiple SDGs.[35]

PANORAMA

Several case studies have been produced in collaboration with the PANORAMA – Solutions for a Healthy Planet initiative. PANORAMA uses a modular case study format, identifying replicable key success factors ("building blocks") when documenting solution case studies. It relies on peer-to-peer exchange and is applicable across topics, sectors, and audiences. All PANORAMA solutions adhere to defined quality standards and are peer-reviewed by experts. PANORAMA is a joint initiative of ten leading conservation and development organizations: GIZ, IUCN, UN Environment, GRID-Arendal, Rare, The World Bank Group, UNDP, ICCROM, IFOAM - Organics International and ICOMOS. IUCN co-hosts the PANORAMA partnership secretariat and coordinates six of PANORAMA's eight thematic communities: Protected and Conserved Areas (with UNDP), Marine and Coastal (with GIZ, GRID-Arendal, UN Environment), Business Engagement, Sustainable Urban Development and Resilience (with World Bank Group), Nature-Culture (with ICCROM, ICOMOS) and Forest Landscape Restoration (with GIZ).

3. Status of our natural capital

3.1 Status of our natural environment and resources

Every year, the World Economic Forum publishes a *Global Risks Report*, identifying urgent and serious risks to commerce and industry. In 2020, for the first time, all five "top risks" were environmental (extreme weather, climate action failure, natural disasters, biodiversity loss and human-made environmental disasters). It notes that "Habitat protection and restoration are highly beneficial public goods for which government investment is more than justified."[36] This extraordinary judgement from an institution not usually recognised for its green credentials comes in the wake of a series of analyses that have highlighted the scale and seriousness of threats to global ecosystems, and thus in turn to humanity.

In 2019, the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES)[37] found that degradation has reduced the productivity of 23 per cent of the global land surface; 33 per cent of marine fish stocks were harvested unsustainably in 2015; 100 to 300 million people face increased risk of floods and hurricanes; 25 per cent of greenhouse gas emissions are caused by land clearing, crop production and fertilisation; and human actions threaten more species with global extinction now than ever before.

A year earlier, the Ramsar Convention published *The Global Wetland Outlook*, which found that in areas where data are available, wetlands have declined by 35 per cent since 1970, leaving many freshwater and coastal species on the edge of extinction.[38] And in 2017, the UN Convention to Combat Desertification released its first *Global Land Outlook*, which concluded that 1.3 billion people currently live on degrading agricultural land.[39] Despite decades of conservation efforts, forest loss is continuing at a high level throughout the tropics.[40] Net losses averaged 3.3 million hectares per year between 2010 and 2015; 12 million hectares were destroyed in 2019 alone.[41] No global figures for grassland and savannah loss exist but rapid conversion is occurring in many parts of Africa and Latin America, sometimes worsened by forest protection efforts diverting agricultural clearance to grasslands.[42] Pollution from pesticides and fertilisers is contributing to catastrophic losses of insects[43] and is poisoning freshwater and marine areas such as Australia's Great Barrier Reef in Australia.[44]

The world's oceans are also under intense pressure. In addition to the overfishing identified by IPBES and others, bottom trawling is destroying fragile seabed habitats in many coastal areas.[45] Ocean acidity has increased by 30 per cent since the start of the Industrial Revolution with profound implications on marine life.[46] More recently, the extreme threats posed by ocean de-oxygenation have also been highlighted.[47]

And it seems that almost daily, news about the rate and impact of climate change grows steadily worse.[48] Talk of a Green New Deal, or even of meeting existing commitments under global conventions on climate, biodiversity and desertification are in danger of being drowned out by a reactionary backlash from governments and powerful industry figures deeply in denial.

3.2 Status of effective area-based conservation

As highlighted in section 2, effective area-based conservation is at the heart of global efforts to both conserve and sustainably use natural capital. The steady reported increase of protected area coverage over the past decades has been one of the few beacons of hope in the sea of worry on the status of the natural environment. Total reported protected area coverage has more than doubled since 1990.[49]

The World Database on Protected Areas (WDPA),[50] compiled by the UNEP World Conservation Monitoring Centre[51] in Cambridge, UK, keeps track of the global protected area coverage. Data from the WDPA, including name, size, date of creation, IUCN management category, etc., eventually feeds into official global figures in the *UN List of Protected Areas*. The WDPA lists 261,766 protected areas. Just over 20.4 million km^2 are on land, equivalent to 15.53 per cent of the Earth's land surface (excluding Antarctica) and 28.6 million km^2 or 7.65 per cent of the world's oceans.[52] This means that an area of the world greater than South and Central America is now in protected areas.[53] Well over half of these have been recognised since 1970. South America, Africa, Russia, Greenland and Australia tend to have very large reserves (and may have proportionately fewer in number), while other regions, especially Europe, have larger numbers of smaller reserves.[54] There are signs that the rate of protected area designation is slowing.[55] Some marine protected areas are enormous, although there are debates about how genuine the conservation is in some MPAs.[56]

However, it is up to governments as to what they report to the WDPA, which means that a proportion of the reported areas do not meet the definitions of either IUCN or the CBD, and there are still gaps and mistakes in the system. There is often a time-lag between countries creating and reporting new protected areas, and in the time taken before protected areas are loaded onto the WDPA. Protected areas are sometimes counted twice (for instance if the name changes), and many governments only report state-run protected areas; statistics on private, community and Indigenous protected areas are known to be too low. Removal of protected areas (degazettement) is a growing problem in some parts of the world.[57] Despite these difficulties, the WDPA is, in general, considered as a robust and relatively reliable tool for tracking progress in the development of the global protected area network. Less is known about the effectiveness of protected areas. Information from surveys to date suggests that a significant number are not performing as well as required.[58]

Indigenous and Community Conserved Areas (ICCAs) – sometimes known as Territories for Life – are much less thoroughly reported and studied, although countries such as India[59] have good data. In general, most ICCAs are not recognised officially as protected areas, therefore they fall outside – or rather are additional to – the above statistics. Some are already in protected areas, some would qualify as protected areas, some as OECMs, and some perhaps as neither. The ICCA Consortium estimates that global ICCA coverage will approximately equal in coverage the land area under state protected areas,[60] although this is derived from calculations of territory where Indigenous people live. Indigenous people are stewards of or have tenure rights over an estimated 38 million km^2 in 87 countries; much or most of this land contains high biodiversity, much of it recognised as being within Key Biodiversity Areas, and 60 per cent is outside protected areas.[61] How much of this land and water will really be secured in ways that guarantee long-term ecosystem conservation remains unclear, although the development of more flexible tools such as OECMs offers new opportunities.[62]

No overall figures therefore exist for the extent of effective area-based conservation. The range of what is "included" has expanded rapidly over the last two or three years, particularly with the recognition of other effective area-based conservation measures (OECMs). Consequently, statistics are likely to change substantially, perhaps dramatically, in the next few years as states begin to list OECMs alongside protected areas and as

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Rangers on patrol Nyika NP, Malawi.

more Indigenous peoples' territories and privately protected areas are recognised officially for their conservation values and perhaps also due to more ambitious conservation targets from the international community after 2021. Although at the time of writing the potential of OECMs is still not really known, a picture is starting to form of where OECMs might be situated and what their area coverage might be, for example through a recent study in the Mediterranean.[63] Analysis of 740 terrestrial Key Biodiversity Areas[64] – "sites contributing significantly to the global persistence of biodiversity" – in ten countries found that 76 per cent of those containing no protected areas were at least partly covered by potential OECMs.[65]

Across all categories, not all conserved areas are in the optimal places for biodiversity conservation; there are large protected areas in deserts, mountains and ice fields. Some 35 per cent of Key Biodiversity Areas are not covered by any protected areas, and 5.6 per cent of ecoregions have less than 1 per cent protected area coverage.[66] In the oceans, 88 per cent of areas judged most critical for biodiversity are unprotected.[67] Connectivity between protected areas has increased,[68] but many still remain isolated.

As regards ecosystem services, no global figures exist, so matching these to protected areas remains impossible at the present time. When talking about the wider contribution of area-based conservation to the SDGs, therefore, we are still often reliant on case studies and national-level statistics rather than on a wider, quantified, global picture.

3.3 Status of the sustainable development goals

It is against the increasingly grim state of ecosystems and the environment that the SDGs were identified five years ago. We are already close to a third of the way towards their target date and unfortunately, while progress is being made in achieving some SDGs, for most of the SDGs the current rate of progress is too slow to achieve the set goals by 2030.[69, 70, 71] Additional efforts and novel approaches are therefore needed to speed up the progress. Even more alarmingly, several SDGs are on a negative long-term trajectory, moving away from rather than towards the set goals. This is the case with all the environmentally oriented SDGs including biodiversity, with loss of species and degradation of ecosystems increasing despite the positive trends in protected areas coverage.

The 2019 *Global Sustainable Development Report*, prepared by the Independent Group of Scientists appointed by the United Nations Secretary-General, concluded that only a handful of targets including reducing child mortality and full enrolment in primary school were currently on the trajectory to be achieved by 2030.[72] A few goals, such as eradicating extreme poverty, ending hunger and access to safe sanitation, could be within reach with a foreseeably feasible amount of additional efforts. However, for a significant number of goals – including access to safe drinking water and maintaining genetic diversity – current progress towards the target is estimated to be significantly less than required, indicating considerable additional efforts needed to reach the 2030 deadline.

As indicated above, current trends in the status of our natural environment all point in the wrong direction. To make matters worse, the global material footprint is increasing rapidly, indicating that pressures on both climate and the environment are increasing rather than decreasing. The inability to turn these trends around is highly alarming because continued degradation of the biosphere makes it harder to reach other goals and targets, resulting in cascading effects across all SDGs.[73] Recent analysis also suggests that negative tipping points are rapidly approaching, risking irreversible changes in the environmental conditions that currently underpin our socio-economic wellbeing.[74]

The Box overleaf provides further insights into the progress made on individual SDGs.

In general, the efforts to monitor progress on achieving SDGs are generally challenged by the lack of available and up-to-date data, especially in the global context.[75, 76] Furthermore, unlike the Global Sustainable Development Report cited above, most of the national monitoring frameworks mainly assess trends towards targets rather than the actual *distance* to targets.[77] In other words, existing official frameworks fall short in allowing countries to determine whether the speed of progress is sufficient to reach goals by the 2030 deadline.

It is clear that the 2030 Agenda is not on track, with most of its ambitious targets not on the right trajectory to be achieved within the next decade. The pandemic that has devastated the world economy during 2020 is almost certain to make the situation even worse.[78] It is also clear that the positive trends in protected area coverage alone are not enough to counter the continued loss of biodiversity and ecosystem degradation. Consequently, reversing these trends will require some fundamental rethinking of strategies including the role that protected and conserved areas can play in delivering benefits to both conservation and wider sustainability as outlined in Chapter 2.

Summary of the progress in SDGS

SDG 1: No poverty. The UN is clear that while "the world is not on track to end poverty by 2030", extreme poverty is falling, from an estimated 10 per cent of the global population in 2015 to 8.6 per cent in 2018.[79]

SDG 2: Zero hunger. Hunger appears to be increasing, rising from 784 million undernourished in 2015 to 821 million in 2017.[80] Furthermore, in regions such as Europe where absolute hunger is not an issue, achieving SDG 2 is hindered by the lack of progress in shifting to more sustainable agricultural and food systems.[81]

SDG 3: Good health and wellbeing. Deaths of under-fives from measles, and rate of tuberculosis and HIV are all dropping, while malaria is increasing.[82] At least half the world's population has no access to basic health services.[83]

SDG 4: Quality education. Primary education increased between 2000-2015,[84] but this is "falling far short of what is needed to achieve its target by 2030"; trends show 225 million children aged 6-17 will be out of school in 2030, a 14 per cent fall since 2017.[85]

SDG 5: Gender equality. Some indicators show improvements, such as a decline in female genital mutilation and the closely related issue of early marriage,[86] although both remain common. Structural issues (legal discrimination, unfair social norms, etc.) are still to be addressed in many countries.

SDG 6: Clean water and sanitation. Access to clean water increased after 2000 but levelled out from 2015 to 2017.[87] By 2030, 700 million people could be displaced by water scarcity.[88] The 2018 World Water Week noted lack of progress and called for nature-based solutions.[89]

SDG 7: Affordable and clean energy. The proportion of people accessing electricity rose from 87 per cent in 2015 to 89 per cent in 2017.[90] But progress falls short on all SDG 7 targets (universal access to electricity, clean fuels and technologies for cooking, energy efficiency, increased renewables).[91]

SDG 8: Decent work and economic growth. Real GDP rose 4.8 per cent in LDCs annually from 2010 to 2017, less than the 7 per cent target. Labour productivity is also increasing.[92] Associated targets (e.g. young people in training, gender disparities) appear to be static.

SDG 9: Industry, innovation and infrastructure. Industrialisation in LDCs is too slow to meet the 2030 target.[93] Carbon dioxide emissions per unit of manufacturing are declining, although they remain high.[94]

SDG 10: Reduced inequalities. In over half the countries with data, income of the bottom 40 per cent grew faster than the national average, but the proportion of income going to the top 1 per cent is still increasing.[95]

SDG 11: Sustainable cities and communities. Progress is slow: a quarter of city dwellers live in slum-like conditions and 2 billion have no waste collection.[96] Air pollution in many LDC cities is high, with few improvements, although pollution control in countries like China has made rapid gains.[97]

SDG 12: Responsible consumption and production. Conditions are worsening, the global material footprint is increasing rapidly, outpacing the rate of human population growth.[98, 99]

SDG 13: Climate action. Progress on achieving the Paris Agreement is moving too slowly, with significant push-back in some key countries, and indicators suggest climate change is accelerating.[100, 101]

SDG 14: Life below water. The proportion of coastal marine protected areas has increased rapidly and 104 out of 220 coastal regions improved coastal water quality from 2012-2018,[102] but other indicators – ocean acidification, fish stocks at biologically sustainable levels – are declining.

SDG 15: Life on land. Biodiversity loss and species extinction risk are both increasing,[103, 104, 105] as is land degradation;[106] on the positive side, protected areas continue to expand.[107]

SDG 16: Peace, justice and strong institutions. It is argued that long-term trends are towards a reduction in violence,[108] but currently political and religious conflict and a rapid increase in criminality are directly undermining many SDGs.[109]

SDG 17: Partnerships for the goals. Net global official development aid (ODA) from developed to developing countries has declined in the years since they were agreed.[110]

3.4 Contribution of effective area-based conservation to the sustainable development goals

The following chapters will demonstrate in practice how protected areas and other types of effective area-based conservation across the world function as "multi-delivery tools" for SDGs, by delivering numerous benefits to wellbeing at local to national scale and also by providing an adaptive and inclusive framework for governing natural resources.

There has, to date, been no attempt to pull all this information together into a single analysis, although there have been several attempts to look at total values of ecosystem services. For example, analysis by WWF, combining a global economic model with a high-resolution ecosystem services model, shows that the loss of six ecosystem services under a business-as-usual trajectory leads to losses of US$9.87 trillion in real GDP by 2050.[111]

A study was commissioned from AmbioTEK to deploy the Co$ting Nature platform, developed with King's College London. Co$ting Nature has an "ecosystem service contributions to the SDGs" tool which was used to examine contributions of protected areas to the SDGs. The map in Figure 3.1 below illustrates some of the results.

All protected areas contribute in some ways to the delivery of the SDGs reviewed in this report; however, some contribute to more SDGs than others and some contribute more to a given SDG. Co$ting Nature[112] was used to review the global protected area estate[113] and assess the number of SDGs to which different parts of each protected area contribute the greatest. Figure 3.1 thus provides a quick visual indicator of the overall diversity of the most significant contributions to SDGs made by protected areas. It is important to note that some protected areas, or parts of them, have major contributions to make to specific SDGs, while others contribute to a wide range of SDGs depending on where they are in relation to the supply and demand for particular ecosystem services, the biome protected, the socio-economic context, the type of management, etc.[114]

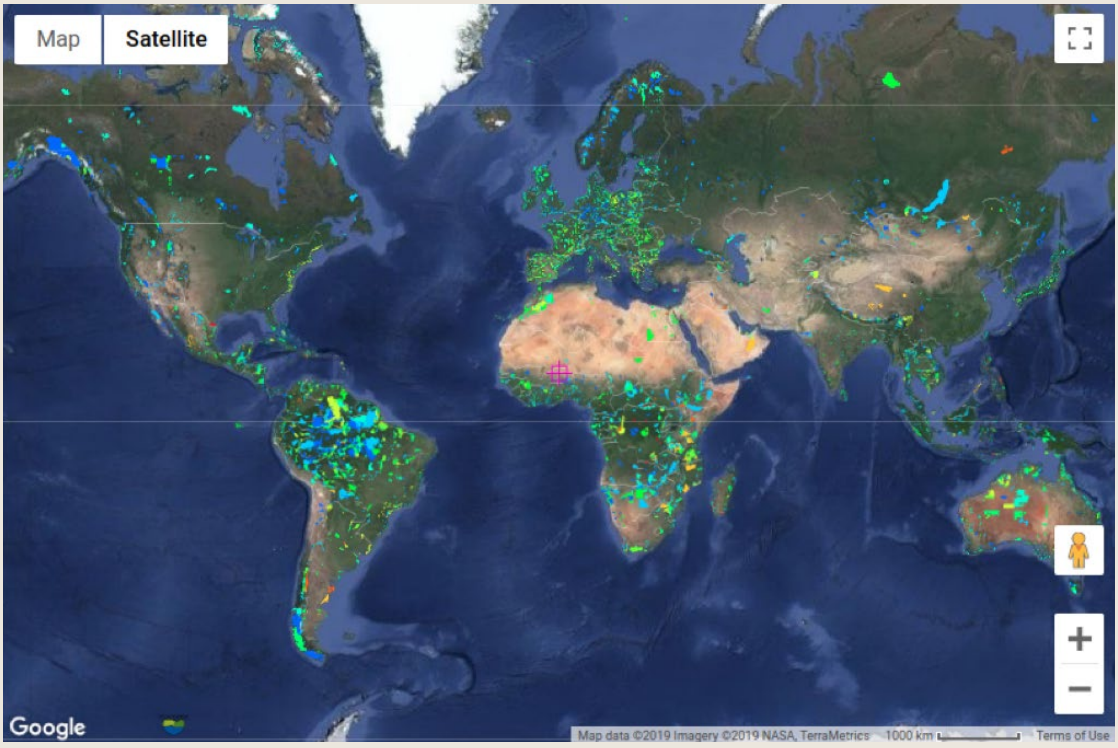

Figure 3.1: Number of SDGs to which nature contributes most.

Protected areas (or parts of) that contribute the most to:
- 2 or less SDGs
- 3-5 SDGs
- 6-8 SDGs
- 9 or more SDGs
- 10 or moreSDGs

Map data © 2021 Google:

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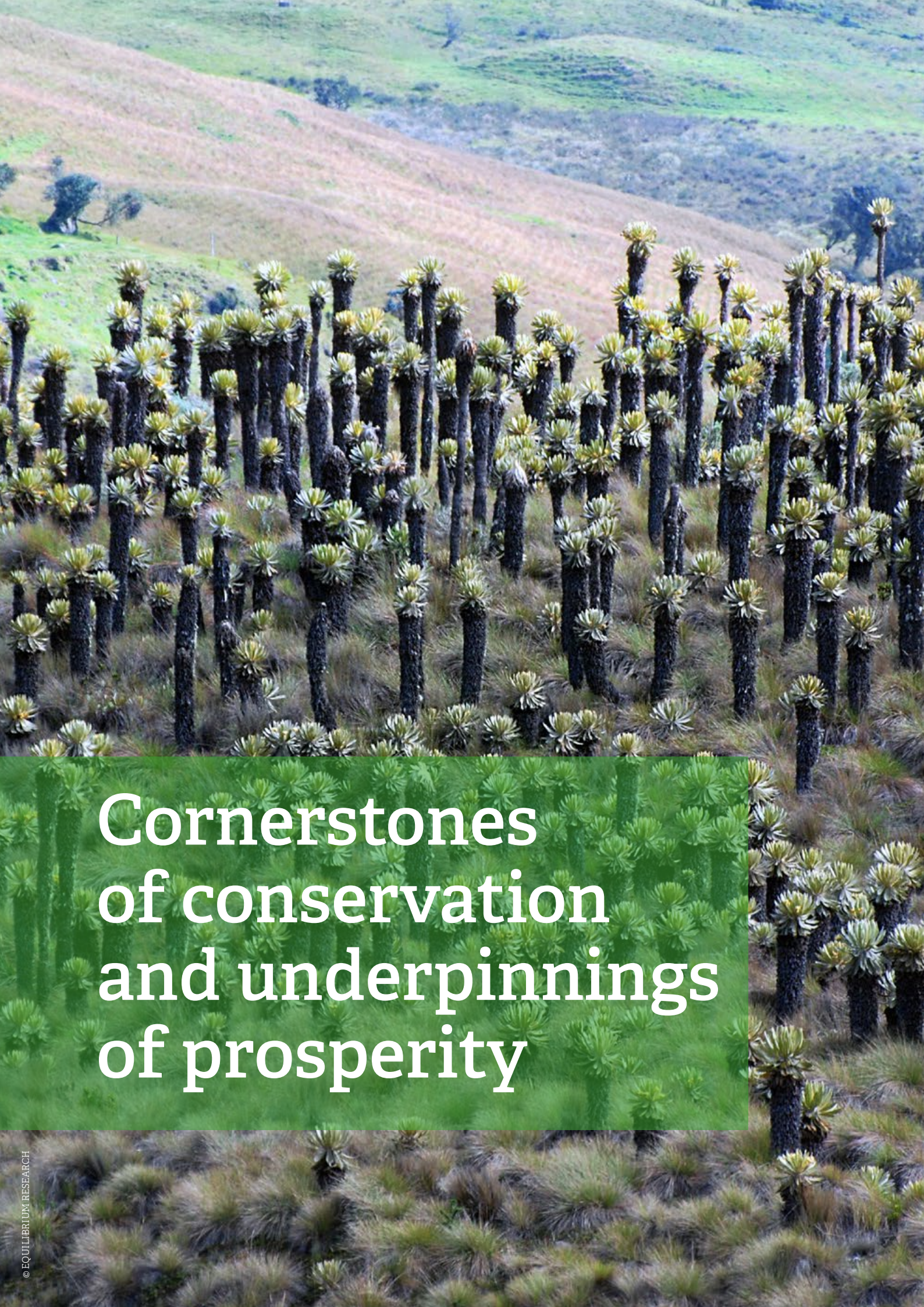
Part B
Goal by goal guidance



Cornerstones of conservation and underpinnings of prosperity

SDG 15: Life on land

Summary for policy makers

SDG 15 addresses critical challenges caused by the continuing loss of terrestrial species and ecosystems, particularly, but not only, forests, wetlands, mountains and drylands. It also considers the failure of sustainable forest management to reverse natural forest loss, ongoing problems of land degradation and growing threats from alien invasive species. By protecting the natural environment people live in, depend on and draw benefits from, SDG 15 can be considered to underpin long-term sustainability on Earth.

Effective area-based conservation remains the single most powerful tool available to conserve biodiversity, and to maintain the integrity of healthy and resilient ecosystems and deliver SDG 15. Many species today only survive through this mechanism. While protected areas are the best-known approach to area-based conservation and should continue to play a critical role in conservation management, other options are available. Most significantly, recognition of other effective area-based conservation mechanisms (OECMs) – places outside the protected area system that nonetheless provide effective conservation often as a by-product of other management priorities – offers chances to dramatically scale up conservation areas. This is perhaps particularly relevant in terms of growing cooperation with Indigenous people in securing both their land tenure and effective nature conservation. Additionally, conservation corridors are needed to maintain ecological connectivity and other land management approaches are increasingly being used as a contribution to conservation management.

What is the challenge?

The recent report from the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES)[1] noted that: "*Human actions threaten more species with global extinction now than ever before. An average of around 25 per cent of species in assessed animal and plant groups are threatened, suggesting that* ***around 1 million species already face extinction****, many within decades, unless action is taken to reduce the intensity of drivers of biodiversity loss. Without such action, there will be a further acceleration in the global rate of species extinction, which is already at least tens to hundreds of times higher than it has averaged over the past 10 million years. ...For terrestrial and freshwater ecosystems,* ***land-use change has had the largest relative negative impact on*** *nature since 1970, followed by the direct exploitation, in particular overexploitation, of animals, plants and other organisms, mainly via harvesting, logging, hunting and fishing*" (our emphasis).

The IPBES report, which received global coverage, held out little optimism for significant improvements any time soon. It is merely the latest in a series of gloomy reviews of the status of biodiversity, from the IUCN Red List of Species,[2] the Ramsar Convention on Wetlands,[3] and in assessments of marine biodiversity,[4, 5] freshwater biodiversity,[6] mammals,[7] birds,[8] reptiles,[9] amphibians,[10] fish,[11] insects[12] and plants.[13] Our state of knowledge on many of the lesser studied groups is still so incomplete that global assessments remain impossible. While success stories, such as the stabilisation of giant panda (*Ailuropoda melanoleuca*) populations in well managed protected areas,[14] demonstrate that effective conservation is possible, even iconic species are declining, sometimes in the face of huge conservation efforts. Lion (*Panthera leo*) populations have fallen steeply in sub-Saharan Africa,[15] and lions now survive in just a quarter of the African savannahs, with only 10 areas in East and Southern Africa relatively secure; elsewhere populations are under serious threat of local extinction.[16,17,18]

Natural forests continue to disappear, and in many areas sustainable forest management still seems a distant goal. In 2014, the New York Declaration on Forests was launched

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to, amongst other aims, halve natural forest loss by 2020. There were almost 200 signatories including global companies, governments, NGOs and Indigenous peoples' organisations. Yet by 2018, the Declaration was already admitting: "*We are not on track … Although partly offset by regrowth, natural forests continued to disappear at an increasing rate. Relative to 2001–13, the average gross annual rate of global tree cover loss* ***was 42 per cent higher in 2014–17***" (our emphasis).[19, 20] In 2018, Forest Trends assessed 469 companies with public commitments to address deforestation. Only 44 per cent had clarified their intention to ensure traceability of products, and less than half of this sub-group had attempted any clear and actionable statements on how they would do this.[21] Deforestation is still destroying forests in tropical countries, with net losses averaging 3.3 million hectares per year between 2010 and 2015; 12 million hectares were destroyed in 2019 alone.[22]

Land degradation, at its most extreme tipping into desertification, is increasing around the world, with an estimated 1.3 billion people, a fifth of the world's population,[23] living on degrading agricultural land.[24] Degradation has multiple facets, including salinisation, affecting some 20 per cent of irrigated cropland;[25] erosion, with estimated rates 100-1,000 times higher than natural and far higher than rates of soil formation; [26] loss of soil organic carbon, primarily through land use change;[27] along with contamination,[28] acidification[29] and compaction.[30] A dramatic decline in soil biodiversity around the world is one of the hidden, but important, aspects of biodiversity loss.[31]

Mountain ecosystems are under particular pressure,[32] with the impacts of over-use in many places being exacerbated by climate change. Other ecosystems, often receiving less attention than forests, are also declining, sometimes as a result of "leakage" of land use change from forest conservation efforts, with grasslands and savannahs being particularly badly impacted.[33, 34] Throughout the world, natural systems outside protected areas are under unprecedented levels of pressure from loss and fragmentation. Even many of those within protected areas also continue to be degraded.

SDG 15 aims to: "*Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss*". This hugely ambitious goal addresses far more than biodiversity, or wildlife conservation. Stabilising terrestrial ecosystems is a critical step in achieving most if not all the other SDGs, underpinning issues of food and water security, political security and climate stabilisation, but also impacting issues like equality, peace and security and the sustainability of the world's urban areas.

SDG 15's targets and indicators address all the issues raised above. They demand conservation of ecosystems, with particular emphasis on forests, wetlands, mountains and drylands, promote sustainable forest management and efforts to combat desertification, and urge the conservation of mountains. SDG 15 also promotes the conservation of habitats and species, and the fair sharing of the benefits that they provide, seeks greater control of alien invasive species and finishes by addressing integrated approaches to conservation planning and sustainable financing for all these actions. Some of the key targets have a 2020 deadline and there is tacit acceptance that they will be revised in line with whatever emerges in terms of 2030 targets from the Convention on Biological Diversity.

How can effective area-based conservation help?

Maintaining species and ecosystems: Protected areas are the main tools for biodiversity conservation in virtually every country in the world. Research shows that well-resourced and effectively managed protected areas prevent the loss and degradation of natural land cover.[35, 36, 37] Protected areas have also slowed the rate of species loss;[38] there is evidence that some species would almost certainly be extinct by now without targeted conservation interventions within protected areas.[39, 40, 41] Protected areas also provide the kind of dedicated management that can help, in many

cases, to address problems of alien invasive species,[42] and to promote restoration of degraded ecosystems.

However, there is also abundant evidence that the current protected area estate is not sufficient on its own to slow the rate of species decline or to prevent the extinction of large numbers of species. Protected area coverage is still nowhere near enough, protected areas are frequently too isolated to provide long-term security to plant and animal populations, they are not always located in the most effective places,[43, 44] and many suffer from serious resource and capacity shortfalls.[45] There is a growing movement arguing for far more ambitious targets for global protected area coverage.[46, 47]

But at the same time, options under conservation are becoming much broader, and thus more complex, with the identification and gradual designation of other effective area-based conservation measures, OECMs.[48] Recognition of such areas, which provide effective conservation outside of protected areas and bring a whole new set of stakeholders into the picture, offer real possibilities to secure major new areas for biodiversity.[49] This matches well with recognition of the conservation effectiveness of many territories of Indigenous people,[50] and the large areas of land and water controlled or claimed by Indigenous people.[51] But it also opens opportunities for working with companies, other local communities, religious groups, the military and other arms of government.

Connectivity areas[52] are increasingly also recognised as key components of the overall conservation matrix,[53] supplemented with more sustainable land management that can supply some aspects of biodiversity conservation, and thus help at a landscape level in conjunction with more dedicated area-based approaches. Such areas may be protected areas, or OECMs, or neither. Targeted interventions will include increasing use of privately protected areas to fill gaps in the network and conserve remnants in otherwise transformed landscapes.[54]

Sustainable forest management is not the primary concern of protected areas, and areas of sustainable forest management are not protected areas. However it is likely that some OECMs will include managed forest areas, judged on a case-by-case basis, and protected areas managed under IUCN category V (protected landscapes) often contain managed forests, particularly in Europe. Some old managed forests contain biodiversity that has adapted to and become reliant on these cultural ecosystems over millennia and these are sometimes included within protected areas. IUCN's OECM guidance recognises as potential OECMs "*Traditional management systems that maintain high levels of associated biodiversity. These could include certain agricultural or forest management systems that maintain native species and their habitat*".[55] There is a continuing debate about the value of managed forests for biodiversity in terms of total number of species supported.[56, 57] But there is little question that such forests can provide valuable buffering of protected areas, habitat for a proportion of endangered species and important connectivity opportunities.

Drylands and desertification:

Effective area-based conservation is also seen as a means of helping to restore land, reduce soil erosion and ultimately prevent degradation.[58] Natural vegetation is a cost-effective stabilising factor to control erosion, dust storms,[59] dune formation and desertification, while the elimination or even reduction of livestock grazing in dryland protected areas can permit vegetation recovery.[60]

Protected and conserved areas thus offer a portfolio of approaches to addressing the critical issues relating to loss and degradation of ecosystems and the whittling away of the world's rich biodiversity. Some of these approaches are already very well known. Others are newer or still under development. They are also supplemented by management actions such as the reduction of degradation in drylands, which are also priorities of this wide-ranging SDG.

Approaches that support SDG 15

Protected areas

- These should continue to form the backbone of any conservation strategy, providing focused attention on biodiversity and management expertise to conserve fragile populations and where necessary restore degraded landscape. These will include protected areas in mainly natural landscapes and seascapes (IUCN categories I-III and VI) and those in fragmented or modified landscapes and seascapes (categories IV and V), where management strategies will be different and may involve maintenance of long-established cultural practices associated with key biodiversity.

OECMs

- These will increasingly be identified and managed by both governments and non-governmental actors, bringing new areas within overall conservation planning, and recognising, and where necessary improving, associated management actions aimed at maintaining biodiversity.

Key complementary approaches

These may be applied in protected areas, or OECMs, or in other effective area-based strategies:

- **Connectivity corridors and steppingstones** can play a critical role in ensuring that remaining natural ecosystems do not become genetically isolated, they may be natural ecosystems or managed ecosystems that nonetheless allow movement of target species.
- **Indigenous peoples' territories and local communities' land and water** are increasingly recognised as vital repositories of nature, and in turn their biodiversity values can provide important arguments for retaining them under their traditional ownership and governance patterns.
- **Climate refugia** that remain relatively buffered from contemporary climate change over time and enable persistence of valued physical, ecological and socio-cultural resources are particularly useful in maintaining species and associated ecosystem services.

Case study

Protecting the Papua New Guinea tree kangaroo, eradicating poverty and building livelihoods of local communities

Yopno-Uruwa-Som Conservation Area, Huon Peninsula, Papua New Guinea

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Co-benefit SDGs

Midori Paxton and **Andrea Egan** (UNDP). **Trevor Holbrook** and **Lisa Dabek** (Tree Kangaroo Conservation Program).

"I can see young people in Huon Peninsula's Yopno-Uruwa-Som (YUS) are beginning to realise their role in the community as future leaders. Likewise, the broader community has shown their appreciation for youth interest in upholding cultural values in connection with the YUS environment."

– Gibson Gala, TKCP Education & Leadership Coordinator –

Background: Tree kangaroos are found only in the rainforests of Australia, Indonesian West Papua and Papua New Guinea (PNG). Looking like a cross between a kangaroo and a lemur, they have adapted to life in the trees, with shorter hind legs and stronger forelimbs for climbing. Despite weighing up to 10 kg, tree kangaroos are remarkably elusive and often invisible high in the forest canopy.

In Papua New Guinea, tree kangaroos are the flagship species for the rare cloud forests – a high elevation rainforest characterised by low-level cloud cover. As a flagship species, the health of the tree kangaroo reflects the health of their wider ecosystem. By focusing on and achieving conservation of the tree kangaroo, the status of many other species that share its habitat – and are vulnerable to the same threats – may also be improved.

Found from the western side of Papua New Guinea to the eastern coast of the Huon Peninsula, many of the 14 known tree kangaroo species call PNG home, living in some of the last undisturbed rainforest habitat in the world.

Papua New Guinea's Huon Peninsula is an extremely rugged mountainous area rising from the famed Coral Triangle to 4,000-metre peaks and is blanketed by one of the world's largest remaining cloud forests.

The Huon Peninsula's Yopno-Uruwa-Som (YUS) landscape is dotted with 50 remote villages, home to about 15,000 people who, under PNG's customary land tenure system, collectively own and control their entire 1,600 km² landscape.

Rural communities in PNG live a primarily subsistence lifestyle, relying on their natural resources and fertile soil as their ancestors did for generations before them. However, community leaders in YUS noticed worrying challenges that previous generations had never experienced: important resources were becoming scarce.

"Our hunters had to travel longer distances to find animals in the forest. Sometimes we

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had to hunt in areas belonging to other clans without their consent because we could not find enough in our traditional land to feed our families."

– Matthew Tombe, Isan village, YUS –

Sustainability challenge: Sought after for subsistence hunting and comprising a part of rural PNG communities' diets for centuries, several species of critically endangered tree kangaroos have been hunted almost to extinction. But local communities and conservation groups are now fighting together to save them.

The landowners of YUS were determined to find a lasting solution and, in 1996, met Dr Lisa Dabek, a conservation biologist who came to YUS to study and conserve the endangered Matschie's tree kangaroo (*Dendrolagus matschiei*) – endemic to the Huon Peninsula. Despite diverse perspectives and interests, they united around a common objective: protecting the Matschie's tree kangaroo and its habitat along with supporting the YUS communities. With this partnership, the Tree Kangaroo Conservation Program (TKCP)[61] was born.

Over the years that followed, stakeholders across YUS – inspired by respected landowner Mambawe Manaono of Kumbul village – traversed their landscape to advocate for conservation and sustainable use of the forests for the wellbeing of future generations.

Together with the Tree Kangaroo Conservation Program, locals had an ambitious goal: collecting land pledges from dozens of clans across YUS and creating the country's first nationally recognised conservation area. In 2009, with more than 78,000 hectares of land pledged, their goal was achieved and the YUS Conservation Area was established.

"With the creation of the YUS Conservation Area and the support for conservation throughout YUS, I am seeing a huge change. I am seeing animals just on the edges of the villages, the gardens and even within village boundaries. More and more YUS villages are pledging areas of their customary land for conservation so that they can contribute and benefit from these changes as well."

– Matthew Tombe, Isan Village, YUS –

Under PNG's unique land tenure system, more than 90 per cent of all land in the country is held and controlled by customary landowners. As such, the sustainability of conservation efforts depends upon the commitment of local tribes and clans. In these remote, difficult to access places, work in PNG to save the tree kangaroos is fundamentally about empowering local environmental stewards.

Conservation solution: The TKCP and the YUS Conservation Area have become a national model for conservation within the unique context of PNG's customary land tenure system. With funding from the Global Environment Facility and UNDP support, the Tree Kangaroo Conservation Program is building the capacity of local communities and other stakeholders to manage the YUS Conservation Area in perpetuity.

The YUS Conservation Area is achieving its objectives; the forests and ecosystem are healthy, and key species like the Matschie's tree kangaroo are thriving in the protected areas. The people of YUS are also benefitting

Case study

from project activities, which have brought substantial improvements to local livelihoods like coffee and cocoa, as well as new opportunities for education and health. Now a team of local YUS Conservation Area Rangers monitors the protected area on a monthly basis.

"Our clans have lived here for generations – we are a part of the landscape. I think that what we are doing here shows that we can play an important role in conservation."
– Nomis Simon, Singorokai village, YUS –

Since the creation of the YUS Conservation Area in 2009, the Tree Kangaroo Conservation Program has expanded from its mountainous roots to embrace a "ridge to reef" landscape approach, including initiatives for the conservation of marine and coastal reef ecosystems and associated coastal agricultural areas, as well as settlements belonging to more than 50 villages within the YUS area. It has also shifted from a single-species focus to include a wide range of endemic and threatened species, such as leatherback turtles, dugongs and long-beaked echidnas (*Zaglossus*). Involving coastal communities in conservation action whilst providing sustainable economic opportunities has been a critical step in ensuring the long-term sustainability of the YUS Conservation Area.

Protecting the biodiversity and habitat of YUS requires coordinated commitment and action across the entire landscape, both in and around the Conservation Area. To sustain the needs of local communities, the natural resources and services provided by the environment beyond the protected area must be maintained for the benefit of current and future generations. Managing the responsible use of the forest products, wildlife and water in these areas will ensure the YUS communities' continued commitment to protecting the YUS Conservation Area.

TKCP directly supports the communities in the tree kangaroos' native habitat, who in turn protect their ecosystem. The people of YUS rely on the natural environment for their day-to-day needs. TKCP works with communities to address their need for sustainable livelihoods, access to health, education and skills training. In partnership with the government, businesses and other NGOs, TKCP builds connections to provide YUS communities with alternative opportunities which build local resilience and reduce the threat of short-term financial gain through large-scale resource extraction.

Lessons learned: With the fate of the tree kangaroo bound up with their native ecosystems and the people who rely on them, conservation success depends on finding a balance between human need and nature's requirements. Eradicating poverty and building livelihoods is therefore critical in the fight to save the tree kangaroo and in ensuring sustainable land and resource use.

Tree kangaroos are the flagship species for the rare cloud forests and losing them would create reverberations throughout these ecosystems. This, in turn, would lead to follow-on effects for the local communities who often rely on the tree kangaroo's habitat for food, medicine and fuel. Protecting tree kangaroos means conserving its environment for the benefit of people and nature.

Next steps: In 2020 a new Strategic Plan was developed for the next 5-10 years of the YUS Conservation Area and TKCP. TKCP will focus on a landscape approach and regazetting as a YUS Landscape Conservation area to include the core protected area as well as sustainable land use throughout YUS. Work is also taking place to build up the YUS Conservation Endowment to support management of the Conservation Area for the long term. And TKCP has also just started as a partner in a USAID Biodiversity project as a Learning Landscape to share with other NGOs how to successfully create and sustain community-based protected areas in other areas of PNG.

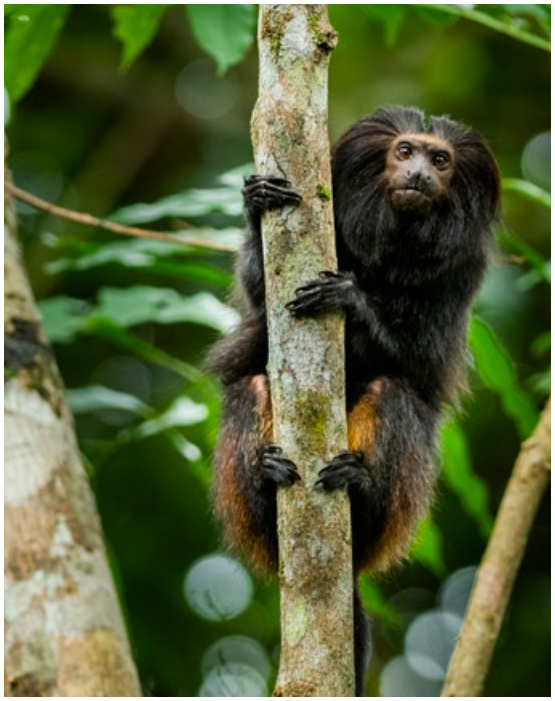
This case study is based on the photo essay: A Home in the Clouds,[62] *plus written material and direct input from project partners at TKCP.*

Information linked to this case study can also be found through the PANORAMA initiative.

Case study

Saving the black lion tamarin, securing long-term sustainability for local communities

Morro do Diabo State Park and Black Lion Tamarin Ecological Station, São Paulo, Brazil



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"The man in red (debt) does not protect the green (environment). IPE understands this dilemma and has paid attention to environmental and social needs."

– Valentim Deagsperi, settler from the agrarian reform –

Background: The Brazilian Atlantic Forest is one of the richest ecosystems on Earth and today highly endangered. The number of species it holds is extraordinary and many are now disappearing. Among them are the four lion tamarins, each endemic to a portion of this biome. The black lion tamarin (*Leontopithecus chrysopygus*) inhabits the western portion of the state of São Paulo, and for more than 60 years was considered extinct. It was rediscovered in the Morro do Diabo State Park, in the early 1970s by Adelmar Coimbra-Filho but was subsequently listed on IUCN's Red List as among the ten most endangered species in the world.

In 1992, the Institute for Ecological Research (IPE), an NGO, was founded to support the work of Claudio and Suzana Padua and a group of young students who had initiated the first studies of the species in the early 1980s. Many of the original group of interns and researchers stayed on and today, besides continuing the efforts to save the black lion tamarin and its forests, IPE counts on more

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Co-benefit SDGs

Suzana M. Padua, Maria das Graças de Souza and **Gabriela Rezende** (IPE – Institute for Ecological Research).

IPE INSTITUTE FOR ECOLOGICAL RESEARCH

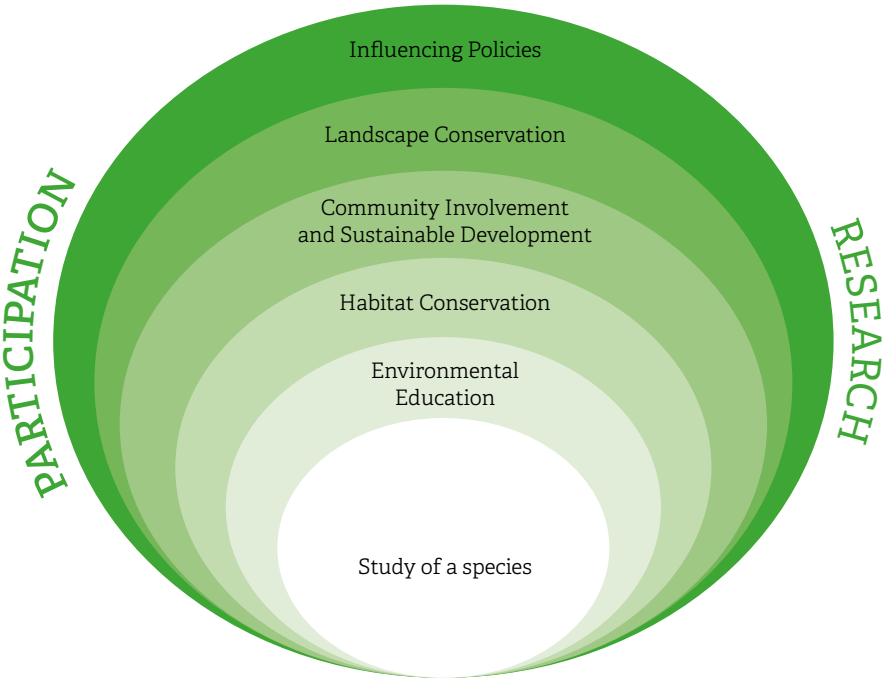

Figure 15.1.
IPE Conservation Model.[65] Based on Valladares-Padua, Cullen Jr., Martins & Lima (2002).

than 100 professionals working on numerous projects in many regions of Brazil, including in the Atlantic Forest, Amazônia, Cerrado and the seasonally flooded ecosystems of the Pantanal of Mato Grosso do Sul.[63]

What started out as a field study to understand the ecology and needs of the species in its original habitat quickly had to be expanded to embrace the complex issues encountered in securing the future of the black lion tamarins. This included addressing issues linked to the socio-economic security and wellbeing of local communities.

Consequently, the conservation of the species soon proved to be more complex and demanded broader approaches, including the search for sustainable development alternatives for the region and other measures (Figure 15.1). Currently the region hosts two conservation areas: the Morro do Diabo State Park (established in the 1940s) and the Black Lion Tamarin Ecological Station (established in 2002). The former consists of a 37,000-hectare area administered by the Forestry Institute of São Paulo, and the latter is composed of four fragments under federal administration.

Sustainability challenge: The forests of western São Paulo were historically devastated in different regions since the 1950s, especially due to unsustainable land-use practices. The native forests that survived in this region, however, are key to guaranteeing the protection of the original biological diversity and related ecosystem services (e.g. soil protection, water quality and carbon sequestration) and to avoid the consequences of climate change; change that is already being felt locally. For example, extreme heat effects and water scarcity have become current concerns in the region with conservation and reforestation alleviating both these risks. To enable the delivery of conservation and wellbeing benefits, the existing forests need protection and enhancement as they suffer from edge effects (i.e. the exposure and susceptibility to adverse weather and agricultural practices on the borders of the forests). Consequently, without conservation and restoration efforts the forests are at risk of losing their ecological integrity and associated benefits to local communities.

Conservation solution: To address the above, tree planting plays a key role in the conservation efforts. Millions of trees are being planted around key forest fragments and in corridors that link these fragments. In addition, small agroforestry plots are created with the planting of native trees together with

shaded coffee and other products that enrich local people's diets and also bring back birds and insects that then spread seeds for free. These measures help maintain the integrity of the ecosystem and mitigate the effects of climate change when deforestation occurs.[64]

Over the years, the Morro do Diabo State Park and the Black Lion Tamarin Ecological Station have become drivers for forest restoration activities and the promotion of sustainable land-use practices within the region. The first step towards addressing the threats to both the black lion tamarin and the long-term sustainability of remaining native forests has been to engage local communities through environmental education. When people were made aware of the importance and rarity of a primate that was largely restricted to just the forest where it was rediscovered and the few remaining fragments, they became more interested and involved in its protection. Furthermore, environmental education has helped share information on the role well-functioning forest ecosystems play in supporting wellbeing and livelihoods for the communities themselves.

The second step involved saving the forest habitat of the species. It was particularly important to reduce the pressure on the Morro do Diabo forest and enrich the remaining fragments. Landscape planning became a priority and IPE conducted the design of a "Dream Map" for the region (figure 15.2), which points to where protection is most needed, or where habitat restoration must be carried out. In this way, the IPE team identified where to re-establish connectivity among the forest fragments in the region and plant buffer zones. Everything is done with the involvement of local stakeholders and community members, mainly comprising poor families settled in an agrarian reform programme that resulted in thousands of small plots, many adjacent to what still remained of the original forests.

To support and promote reforestation and restoration initiatives, IPE offers training through meetings and workshops on why and how planting trees can be beneficial and where to plant different species, explaining the advantages for wildlife and for the people. Guidance is provided to ensure that the seedlings are healthy and of adequate size, preferably grown and cultivated by the families themselves so as to provide them with an income. At the time of planting, a community gathering is organised with all taking part in a celebration, and then planning the necessary monitoring and

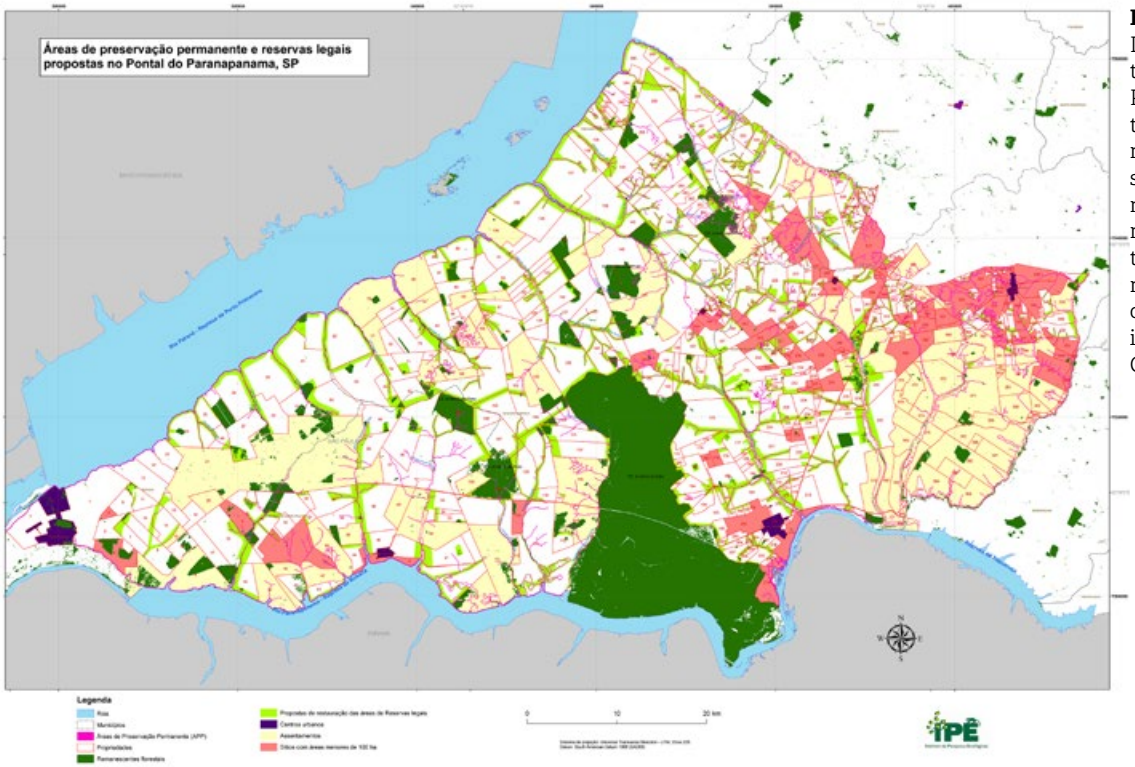

Figure 15.2. The Dream Map of the Pontal do Paranapanema, the westernmost region of São Paulo state, Brazil. The map is a tool for regional planning to prioritise reforestation and other conservation initiatives. Based on Cullen, Jr. (2020).

maintenance of the restored areas – checking for the presence of damaging ant colonies, making sure that cattle and other livestock that would eat and trample the seedlings are kept away, and monitoring the seedlings for any signs of disease or insect pests.

A key objective of forest restoration, besides enriching the environment, was to identify and establish sustainable alternative livelihoods for low-income households, with a focus on nature-based solutions. The aim was to improve people's livelihoods and, at the same time, "green" the region through native tree nurseries for reforestation, and by encouraging and supporting the manufacture of handicrafts that are decorated with images of local species. Planting buffer zones and gallery forests (along riverbanks) on a large scale was particularly encouraged, with the additional incentive that water protection had become a primary concern in the region.

Local communities are central to addressing regional sustainability challenges. It is important that people feel part of the process and, consequently, become involved in the maintenance of the forests they have planted. In order to promote this approach, the "Dream Map" for regional planning was key in identifying priorities regarding forest corridors and other initiatives, such as where corridors were most needed, where forests had to be better protected, or where people could help and also where people represented a stronger threat to the environment, for that is where IPE needed to work the most (Figure 15.2). This visualisation of what could and should be done has been helpful to decision-makers and in influencing policies for conservation-related measures in the region.

The native forests that survived in western São Paulo are key to guarantee the survival and enrichment of the entire Atlantic Forest of the Interior biome. Over the years, IPE has developed strategies and techniques in all the different reforestation stages, mainly based on the research that it has conducted. Examples include how to plant different tree species, at what time of the year, how to involve local people in diverse ways according to circumstances, how to proceed in collecting data in the field on black lion tamarins, jaguars, tapirs and other species. Technologies used also include the use of

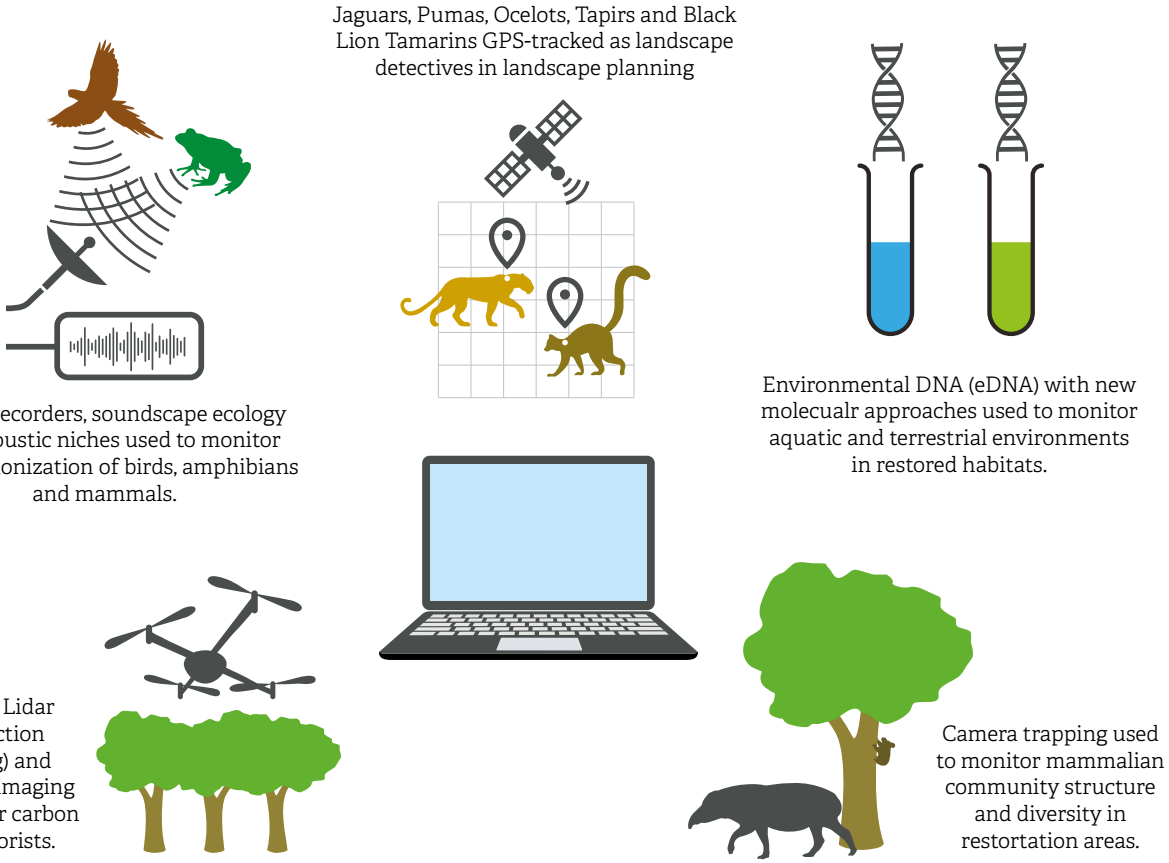

Figure 15.3. Use of different and innovative technologies in ecosystem services monitoring developed by IPE in the Pontal do Paranapanema.[66]

drones, camera traps and tape recorders with the sounds of the animals being studied and Light Detection and Ranging (LIDAR). These innovations have been introduced as they became available over time, and are valuable to the data collection, and thus to the overall outcomes of the research conducted. Therefore, there has been a refinement of different techniques, and evaluation has been key to indicate where success occurs and where adjustments are needed (Figure 15.3).

Key benefits: The area-based conservation approach adopted for the Morro do Diabo State Park and the Black Lion Tamarin Ecological Station aims to ensure that everyone benefits over time: the natural habitats are enriched and restored while local people are trained in arboricultural techniques and tree-planting, which generally provide for additional incomes, as do handicrafts focusing on local nature, both helping the communities to become more aware of the importance of protecting nature. IPE has worked with over 400 families and the demand for cooperation is increasing, with a priority for working with those who inhabit lands adjacent or near to the protected areas or to remaining natural forests. The restored forests also act directly in mitigating the effects of climate change, supporting in particular water provisioning, water and soil quality, and crop protection. Research is often conducted on the flora and fauna, water and soils. This improves the understanding of environmental benefits associated with forest ecosystems, helping to empower communities to receive support.

Lessons learned: Climate change is a reality and forests play a key role in minimising its effects. When forests are present, water is abundant and of good quality, floods do not often happen because of the natural coverage, the soil is rich and fertile, and the air is pure. Agriculture and other human activities flourish. This has been recognised by local people, especially those involved in reforestation. There were complaints about environmental degradation and its effects and local people are now expressing how the forests are making a difference in many aspects.

Key lessons learned include:

- Area-based conservation can support not only species conservation but also broader long-term wellbeing and sustainability in the region. However, area-based conservation approaches need to take into consideration the landscape as a whole, and act based on a broad plan to be implemented step-by-step with a long-term vision; conservation is a complex field and the team of professionals engaged must be willing to work in an interdisciplinary and cooperative way;
- Conservation actions and initiatives are more likely to be successful if they are science-based (long-term research) and integrate social, environmental and economic aspects;
- Local people should be involved right from the project's conception and empowered to solve problems and contribute to solutions that often they themselves bring about;
- The outcomes are not always the expected ones, so adaptive management is crucial to guarantee that adjustments are made during project implementation;
- Evaluation should occur at all stages of a project's implementation, in order to avoid discovering mistakes only in the final phase.

Next steps: More forests need to be planted everywhere the "Dream Map" has identified as important. Reforestation is needed within protected areas, around forest fragments, forming a buffer of protection that promotes a natural expansion of the forest fragments, and in forest corridors to restore connectivity among the remaining fragments. IPE's aim as such is to increase native forest protection and available habitats for the regional fauna, especially for the black lion tamarins and others that do not dare leave the forests. The "Dream Map" prioritises areas that need immediate action and others that can go at a slower pace. Much has been done, but more corridors and buffers must be planted to increase the protection that healthy and thriving rivers and forests can provide to mitigate the effects of climate change and other numerous deleterious consequences of unsustainable human actions.

Case study

Private conservation of remnant forest ecosystems to support sustainable development

Grand Bois Privately Protected Area, Haiti

Co-benefit SDGs

Robin Moore, Global Wildlife Conservation and S.Blair Hedges, (Temple University).

re:wild

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Background: Haiti's biodiversity is threatened by the almost complete loss of primary forest cover, which has been reduced by some estimates to approximately 0.3 per cent of the original;[67] one of the highest losses in the tropics. Forests have continued to be destroyed even within national parks and 42 out of the 50 highest mountains have lost all their primary forest.[68] Even taking into account technical concerns disputed among experts,[69] less than one per cent of primary forest remains, placing biodiversity in peril.[70] Deforestation has already caused the extinction of endemic species, by inference, and many more species are under severe threat.[71]

Sustainability challenge: The primary pressures include smallholder agriculture and charcoal production.[72] There are larger areas of secondary forests and plans for reforestation,[73] but any forests other than primary forests will support only a small fraction of the original biodiversity. Some timber use, including some charcoal production,[74] may be sustainable, but the critical conservation priority is to preserve the fragments of primary forests that remain, where many of the endemic species are concentrated.[75]

One of the most important remaining forest areas is on the isolated Grand Bois mountain, with substantial forest cover remaining above a thousand metres.[76] Two research expeditions documented 68 species of vertebrates, including 19 amphibian species, giving this area the distinction of being home to one of the largest groupings of co-occurring frog species anywhere in the Caribbean.[77] Grand Bois is found in Haiti's Massif de la Hotte mountain range, the number one priority conservation site in the country and one of the most important sites for amphibians in the world.[78] Because 19 Critically Endangered amphibian species are restricted to this single area globally,[79] Massif de La Hotte has been recognised as an Alliance for Zero Extinction site,[80] and probably has the world's largest number of

Case study

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known AZE species in a single site.[81] It is also within a Key Biodiversity Area, a nationally identified site of global significance for biodiversity.

Conservation solution: The NGO, Global Wildlife Conservation, has partnered with Rainforest Trust and the local NGOs, Haiti National Trust and Audubon Society of Haiti, to buy the country's first privately protected area on Grand Bois in 2019. The new reserve broadly overlaps with the newly declared Grand Bois National Park, established by the Haitian government in 2015, but where logging was continuing and new approaches were urgently needed. The privately protected area covers about 5 km² including a core of primary forest, offering protection to several rare species found nowhere else on Earth. These include the Critically Endangered Ekman's magnolia tree (*Magnolia ekmanii*), known only from Grand Bois, and the Tiburon streamfrog (*Eleutherodactylus semipalmatus*), until a recent expedition, thought to have been long extinct.

The forest was already being protected to some extent by local people, who recognised its role as a water tower and a means of preventing the landslides that have proved deadly in large parts of the island. There is local community support for conservation of the area, and continued work on long-term restoration around the site. By purchasing the site directly, and employing local people as rangers, the Haiti National Trust is hoping to secure biodiversity, provide disaster risk reduction and water services to local and more distant communities, and also prevent further losses of unique biodiversity.

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SDG 14: Life below water

Summary for policy makers

Marine ecosystems are declining at an unprecedented rate. For example, about half of all live coral reefs have already been lost. Almost a third of reef-forming corals, sharks and shark relatives and over a third of marine mammals are currently threatened. At least 60 per cent of fish stocks are harvested at their maximum capacity and 33 per cent are fished at an unsustainable level – and these are underestimations, because up to 33 per cent of fish catch by weight is illegal, unreported or unregulated. Climate change exacerbates ecosystem loss and extinction risk for marine species due to the increase in average water temperature, heatwaves, deoxygenation and acidification.

SDG 14 requires states to address these challenges and protect marine ecosystems from all the anthropogenic pressures that threaten them. Simultaneously, SDG 14 requires protection and enhancement of livelihood opportunities for coastal communities that depend on marine resources, and especially for small-scale fishers and developing countries.

Effective area-based conservation tools like Marine Protected Areas and Locally Managed Marine Areas can play an important role in both biodiversity conservation and sustainable use of marine resources. This is why Target 14.5 requires protection of at least 10 per cent of coastal and marine areas. In addition, other Spatial Protection Measures linked to sustainable management of fisheries and outside protected areas also have an important role to play. There is a wealth of evidence that shows that area-based conservation tools are essential for the protection and recovery of marine ecosystems and species.

Besides biodiversity improvements, effective area-based conservation can provide socio-economic benefits to local communities, due to enhanced yields for small-scale fishers, both inside and near protected waters, and increased opportunities for the tourism sector.

What is the challenge?

Marine ecosystems are declining at an unprecedented and accelerating rate in human history. For example, the latest assessment by the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) shows that about half of the live coral cover of reefs has already been lost (coral reefs are among the ecosystems with highest biodiversity). The same assessment shows that almost a third of reef-forming corals, sharks and shark relatives, and over a third of marine mammals are currently threatened. Further, more than 10 per cent of the extent of seagrass meadows (which play a key role for biodiversity conservation and carbon storage in the sea) have been lost since 1970.[1] A number of human-induced pressures contribute to this decline, the most important being overfishing, climate change and plastic pollution.

The state of marine fishery resources is continuously depleting due to overfishing. FAO's monitoring data show that in 2015 (the most recent year for which data are available) 60 per cent of fish stocks were harvested at maximally sustainable rates (i.e. they were fully fished stocks), 33 per cent were fished at an unsustainable level, and only 7 per cent were underfished.[2] These figures are underestimations, because up to 33 per cent of fish catch (by weight) is illegal, unreported or unregulated (IUU),[3] with regional variations: in West Africa this share rises to about 40 per cent of total catch by weight.[4] IUU represent one of the most important threats to the sustainability of fishery.

Climate change exacerbates ecosystem loss and extinction risk for marine species, due to the increase in average water temperature, heatwaves, deoxygenation and acidification. According to IPCC's Special Report on the Ocean and Cryosphere,[5] since 1993 the rate of ocean warming has more than doubled and marine heat waves[6] have doubled in frequency and became longer-lasting, more intense and more extensive. Ocean acidification, due to the rising concentration of CO_2 in the atmosphere, and the consequent increased uptake in the oceans, increased by 26 per cent since pre-industrial times.[7]

According to the most recent data,[8] the ocean has already lost 2 per cent of its oxygen inventory between 1960 and 2010, due to reduced solubility of oxygen in water caused by increasing temperatures, reduced ocean circulation and associated ventilation (all phenomena triggered by climate change).[9] Loss of sea ice is having major impacts on marine food webs, fisheries and access for Indigenous people. All the above-mentioned pressures interfere with ecosystem dynamics, with an increasingly negative impact on a wide range of marine species. For example, acidification and heatwaves have a significant impact on warm-water coral reefs and rocky shores dominated by calcifying organisms like corals, barnacle and mussels, and marine heatwaves have already caused large-scale coral bleaching events.[10] According to the latest IPBES assessment, climate change is expected to result in a decrease of fish biomass by 2-25 per cent and a reduction of the ocean's net primary production of 3-10 per cent by the end of the century.

Plastic pollution also represents an increasingly threatening pressure on marine wildlife. It has been estimated that 12 million tonnes of plastic end up in the oceans every year, and notably 8 million tonnes from coastal mismanaged waste, 2 million tonnes from inland waste, 1.5 million tonnes from primary microplastics and 0.6 million tonnes from lost fishing nets.[11] Many marine species ingest, are entangled or suffocated by marine plastics, and floating plastics contribute to the spread of marine invasive species, which constitute another pressure on marine ecosystems. For example, plastic litter affects at least 86 per cent of marine turtles, 44 per cent of seabird species and 43 per cent of marine mammals.[12]

SDG 14 combines targets focusing on the conservation of marine ecosystems and others ensuring their sustainable use. Biodiversity conservation is addressed by Target 14.5, which requires protecting at least 10 per cent of coastal and marine areas, and by three targets aiming at reducing the most important pressures: a) Target 14.1 on marine pollution, including marine debris and nutrient pollution, b) Target 14.3 on ocean acidification and c) Target 14.4 on overfishing. In addition, Target 14.2 combines

the conservation and the sustainable use components, by requiring states to "*sustainably manage and protect marine and coastal ecosystems [...] and take action for their restoration*".

How can effective area-based conservation help?

Area-based conservation can contribute to the two components of SDG 14, i.e. biodiversity conservation and sustainable use. As regards the first, there is wide consensus among experts that Marine Protected Areas (MPAs) are **essential to protect marine ecosystems**.[13, 14, 15] For this reason, both SDG Target 14.5 and Aichi Target 11 of the CBD's Strategic Plan for Biodiversity 2011–2020 require that 10 per cent of coastal and marine areas at the global level are included in MPAs. However, currently only 5.3 per cent of the world's oceans is covered by actively managed MPAs, less than half of which (i.e. 2.5 per cent) is in highly protected (no-take) MPAs.[16]

Besides biodiversity conservation, area-based conservation can also **provide socio-economic benefits to local communities**, thereby contributing not only to Target 14.B and 14.7, but also to a number of other SDGs, including SDG 1 "No poverty", SDG 2 "Zero hunger", SDG 3 "Good health and wellbeing" and SDG 8 "Decent work and economic growth".

Socio-economic benefits can be provided by MPAs via different pathways. Restrictions on fishing inside protected areas can lead to **an increase in fish density and size in surrounding waters** due to the spillover and nursery effect. The first one refers to the movement of fish from protected to unprotected areas,[17, 18, 19] whereas the latter occurs when protected areas act as fish spawning and nursery grounds, thereby benefitting neighbouring areas thanks to the movement of eggs and larvae.[20] In MPAs where restrictions on industrial scale fishery activities are in place**, small-scale artisanal fishers can benefit from higher yields** than in non-protected waters. There is normally a trade-off between level of protection and economic benefits for fishers, as in general, no-take MPAs deliver the best results in terms of ecosystem protection and recovery.[21, 22, 23] However, when well-managed, MPAs allowing some degree of fishing also contribute to marine conservation.[24] The following factors enable MPAs to deliver benefits to small-scale fishers, while maintaining fish stocks at a sustainable level: presence of a management plan, high MPA enforcement, fishers' engagement in MPA management[25] and promotion of sustainable fishing.[26] No-take areas and areas allowing fishing activities can be combined to find a balance between conservation and socio-economic objectives. In fact, about 18 per cent of MPAs at the global level include both no-take zones and zones allowing some degree of fishing. This share is higher in regions with high human density and intense use of the sea (for example, this share rises up to 92 per cent in the Mediterranean).[27] For these regions, ensuring good management, stakeholder participation and enforcement is even more important.

MPAs can provide an **opportunity to increase tourism, which can provide additional socio-economic benefits**.[28] In fact, higher environmental quality and increased recognition of an area as a tourist destination (i.e. the "designation effect") can attract visitors in, or in the vicinity of, MPAs. This leads to increased livelihood opportunities for those owning or working in hotels, restaurants and leisure associations, and in general for the local economy. Tourism can have a very significant impact on marine and coastal wildlife,[29] and for this reason it needs to be managed to keep it within sustainability limits and make sure that the carrying capacity of ecosystems is not exceeded.[30] This requires an effective management plan and enforcement measures, the establishment of strategies to reduce the impact of recreational users and communication activities to promote good practices.[31] The promotion of ecotourism, which provides livelihood opportunities to local communities with limited damage to ecosystems, can play a key role in this sense.

Finally, area-based conservation can **provide opportunities for research and education**. There is a growing body of studies that use data collected inside MPAs and other area-based conservation tools for a wide range of purposes, ranging from the analysis of marine species and ecosystem dynamics to the analysis of the institutional, social and economic factors influencing the delivery of conservation and socio-economic benefits.[32] Moreover, research and development activities based on MPAs are increasingly contributing to innovations in biotechnology applications[33] in different sectors, such as for example food (e.g. alginate extraction), energy (e.g. biofuels from algae), health (e.g. drug development).[34] A good example is the large-scale research project Seafarm, which aims to develop a closed loop biorefinery process for algae in Kosterhavet Marine National Park (Sweden).[35]

Approaches that support SDG 14

All MPAs and marine OECMs contribute to SDG 14 and Targets 14.2 and 14.5 in particular. MPAs and OECMs allowing for a certain degree of fishing activities support also Targets 14.4 and 14.7 linked to sustainable use of marine resources. These types of MPAs and OECMs also contribute to other SDGs, and in particular SDGs 1, 2, 3 and 8. Networks of MPAs and OECMs are often supported by area-based approaches to sustainable use that have some benefits for marine biodiversity while contributing to Targets 14.4 and 14.7. A combination of both conservation and sustainable use approaches provides the most benefits across all SDG 14 targets, and beyond.

Marine Protected Areas

- **Marine protected areas (MPAs)** can be designated under national legislation or to implement international or regional agreements.[36] MPAs can impose different degrees of restrictions over extractive and non-extractive economic activities, ranging from no-take zones, where all extractive activities are forbidden, to multi-use areas, where small-scale fishery and sustainable tourism are allowed. Unfortunately, many MPAs around the globe do not reach the desired conservation objectives because they lack a management plan and, even with a plan in place, enough resources for protection and management – they are "paper parks". For example, only 32 per cent of the 74 managers of Mediterranean MPAs surveyed in a recent study said that their MPA has a management plan that is implemented; only 10 per cent believe that the staff numbers are adequate to their MPA's management needs; and more than half of them have a budget that is inadequate for even basic management needs, including 24 per cent with no budget at all.[37] A recent study by WWF found that even if 12.4 per cent of the EU marine area is included in an MPA, only 1.8 per cent is covered by a management plan.[38] A stronger political commitment is needed for MPAs to fulfil their potential and contribute to SDG 14, which will require a substantial increase of resources for planning, management and enforcement.[39]

Marine OECMs

- OECMs which restrict access for reasons other than conservation or natural resource management, can also benefit biodiversity. They are often called "**de facto refuges**". Examples are offshore wind installations, military exclusion zones and wrecks.[40] Some evidence has been collected on the beneficial impacts of such structures on fish density. For example, a recent study has shown that Atlantic cod and pouting are seasonally attracted towards wind turbines in the North Sea to feed upon the dominant prey species that aggregate there and grow.[41] Some preliminary exercises are being conducted to identify broad types of marine uses that may or may not be potential OECMs.[42]

Another specialised designation is important in marine areas:

- **Locally Managed Marine Areas** (LMMAs) – which are also called **Collaborative Fisheries Management Areas** (CFMAs) and **Community Conservation Areas** (CCAs)[43] – are actively managed by resident or neighbouring communities. There are

many examples around the world of successful LMMAs,[44] such as for example in Kenya[45] and Madagascar.[46] In many cases, LMMAs are more easily accepted by local communities than centrally managed MPAs, as they can be tailored to cater for local needs and contribute to empower vulnerable stakeholders through increased food security and learning opportunities.[47] They can also be more effective because they can make use of local and traditional knowledge on fishery management.[48] LMMAs will usually be protected areas or OECMs but in some cases can be neither.

Key complementary approaches

This includes some area-based approaches that are *not protected areas, nor usually OECMs* but can have benefits for marine biodiversity while contributing to other elements of SDG 14 (e.g. 14.4, 14.7):

- **Fishery Spatial Protection Measures** are temporal or permanent restrictions on fishery activities, such as for example special fishing permits or bans on specific fishing gears to protect specific vulnerable ecosystems or seagrass meadows.[49] Temporary closures of fishery areas,[50] such as for example periodically harvested coral reef reserves[51] or seasonal closures of octopus fishery areas,[52] belong to this category. While these measures cannot be considered as protected areas and only some may qualify as OECMs, they do deliver certain biodiversity benefits and play an important role in delivering SDG 14 targets. These kinds of measures can protect vulnerable species and ensure sustainability of fishery practices. Temporal or periodic closures are particularly beneficial for fast-growing fish populations or for those in low fishing pressure situations, whereas the conservation and restoration of fish populations with longer lifespan or higher fishing pressures may require more permanent forms of protection.[53] **Other marine areas with controls on use or access**, such as areas designated to protect specific species of great importance, can contribute to SDG 14. Examples are the seventeen shark sanctuaries that have been created by coastal and island governments across the globe to reduce shark mortality in their waters.[54] Shark sanctuaries cover almost as much area as MPAs globally.[55] Evidence shows that in shark sanctuaries the shark population decline is less pronounced, less sharks are being sold and there are fewer fishing threats than in non-shark sanctuaries. They can be a useful conservation tool, but in order to fully protect their target species they need to be used in combination with measures to reduce bycatch, ghost gear, marine litter and habitat destruction.[56] However, these only cover one or a small group of species and are therefore not protected areas or OECMs.
- **Particularly Sensitive Sea Areas (PSSA)** are proposed by a state or states and designated by the International Maritime Organization (IMO).[57] They are chosen because of their significance for ecological, socio-economic or scientific reasons and their vulnerability to damage by international maritime activities. To date, there are 14 PSSAs, including the Great Barrier Reef in Australia, the Western European Waters, the Baltic Sea, the Wadden Sea, the Canary Islands and the Galapagos Archipelago. The designation of PSSAs does not prevent international shipping, but places specific rules and controls to limit damage, such as for example the use of compulsory routes to avoid certain areas and bans on discharging waste. Some PSSAs overlap with marine protected areas but PSSA designation alone is not equivalent to being a protected area.

Case study

Protecting corals and seagrass to combat climate change and its impacts

Florida Keys National Marine Sanctuary (FKNMS), the United States

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"Successful management of the Florida Keys National Marine Sanctuary relies on our valued partnerships. We are all part of the solution."

– Sarah Fangman, Superintendent, Florida Keys National Marine Sanctuary –

Background: Traditional management strategies are often insufficient to address the breadth, complexity and speed of climate management challenges unique to the ocean system, such as ocean acidification, dynamic boundaries and high connectivity. MPA professionals further note there is a "concerning disconnect between global oceanic climate impacts and the relative lack of experience and action needed to address these stressors at local and regional scales".[58]

Responding to these challenges, the Florida Keys National Marine Sanctuary (FKNMS), managed by the National Oceanic and Atmospheric Administration (NOAA), is addressing impacts to the sanctuary and surrounding region as well as offering specific examples of how its activities meet the climate related SDG 13[59] target on strengthening resilience and adaptive capacity to climate-related hazards (13.1) and integrating climate change measures into MPA management planning (13.2).

FKNMS protects almost 10,000 km² of ocean and coastal habitat of the Florida Keys archipelago south of the Florida mainland. Established by the United States Congress on 16 November 1990, the sanctuary is home to some of the most diverse and productive marine ecosystems in the country. The mangrove forests, seagrass meadows and coral reefs of the sanctuary are home to thousands of ecologically and economically important species including sea turtles, manatees, spiny lobster and many recreationally and commercially important fishes.

Sustainability challenge: Coral reefs are among the most fundamental habitats

Co-benefit SDGs

Jason Frohnmayer and **Zachary J. Cannizzo** (NOAA).

to the ecology, economy and culture of the Florida Keys. The coral reefs of the Florida Keys are home to thousands of species of fish and invertebrates and provide an economic value of US$8.5 billion for southeast Florida. However, excessive nutrient loading, disease, climate effects and physical impacts such as boat groundings are threatening reefs. Ocean acidification and intense storms damage corals and rising ocean temperatures are causing dramatic coral bleaching events. In addition, Stony Coral Tissue Loss Disease (SCTLD), which first appeared near Miami in 2014, has spread throughout Florida's coral reefs, including over 95 per cent of FKNMS, causing widespread mortality.[60] The combination of human uses, climate change and disease have resulted in the loss of most of the coral cover in the Florida Keys.

Seagrass meadows are another key habitat under stress. The 1.4 million acres of protected seagrass meadows in FKNMS are vital for hundreds of species including sea turtles, manatees and economically important fishes. They also serve as nurseries for reef-associated species while offering coastal protection and carbon sequestration.[61] Climate and other human stressors, such as poor water quality, have substantially degraded seagrasses and their habitats. Boat propellers have scoured large areas of seagrass, while reduced freshwater flow and poor water quality from a century of intensive agriculture have destroyed thousands of acres. Climate change also impacts seagrasses through warming and sea level rise, which threatens to gradually drown these light-sensitive ecosystems.[62]

These impacts also have implications for coastal communities both in and beyond the sanctuary that depend on these resources. Coral reefs are a valuable natural resource that provides fundamental support for the economy while providing opportunities for recreation, education, scientific research and public inspiration. In addition, the fish we catch rely on corals to build the reef structure where they can breed and grow. Medicines that combat cancer, pain and inflammation have also been derived from coral reef organisms. Corals and seagrasses also provide coastal protection, an issue of growing importance as climate change is causing the intensity of coastal storms to increase. Healthy and resilient coral reefs also protect infrastructure and safeguard against extreme weather, shoreline erosion and coastal flooding.

In concrete socio-economic terms, coral reefs are estimated to annually support 71,000 jobs in south Florida. In addition, Florida's Coral Reef provides more than US$355 million/year in flood protection benefits to buildings and protects nearly US$320 million in annual economic activity.[63]

Healthy seagrass beds and mangroves also store carbon,[64] and can be an important part of regional and national climate mitigation plans. However, these societal benefits are threatened by degradation of these ecosystems from climate and non-climate stressors.[65]

Conservation solution: Sustaining a healthy ecosystem within FKNMS is a daunting challenge. A century of human impacts coupled more recently with climate impacts like coral bleaching, ocean acidification, increased intensity of tropical storms and sea level rise have degraded its ecosystem.

However, using a holistic approach, FKNMS staff are working with other NOAA offices, state and local partners, and community stakeholders to integrate adaptation measures into their sanctuary management plan. This climate-informed plan will address the new environmental conditions and deliver solutions both for conservation and socio-economic sustainability in the region.[66]

One of the ways that FKNMS is addressing the effects of climate change is to evaluate its impacts, as well as those of other human stressors, on the key ecosystems in the sanctuary.[67] The recently released restoration blueprint (which also serves as the draft environmental impact statement for the updated sanctuary management plan) draws on the lessons learned from 30 years of science, monitoring, technical experience and community involvement.[68] The blueprint considers alternatives to counteract the decline in vital ecosystems like coral reefs, seagrasses and mangroves through a series of regulatory and management measures

designed to reduce threats and, where appropriate, restore degraded habitats. For example, NOAA proposes expanding zones that provide a higher level of coral ecosystems protection from ship groundings, anchoring and other human impacts. Counteracting declines in "blue carbon" ecosystems such as mangroves and seagrass meadows could further prevent the release of stored carbon into the atmosphere and encourage mitigation through additional carbon sequestration.[69]

The sanctuary has also developed an ambitious restoration plan intended to increase the resilience of its coral reef ecosystems. Titled *Mission*: *Iconic Reefs*, the plan draws on cutting-edge restoration science and years of research, trials and scientific expertise.[70] The mission represents a science-based plan that considers the impacts of climate change while seeking to address the cumulative effects from a wide range of stressors. The plan aims to restore seven reefs that represent the diversity of the Florida Keys and proposes the overarching goal of creating a more resilient coral reef ecosystem while achieving 25 per cent stony coral cover.

Mission: *Iconic Reefs* will protect and restore coral reefs by focusing NOAA and partner resources on a comprehensive restoration strategy informed by climate science. As a part of these plans, FKNMS is working with partners to grow climate and disease-resistant corals in nurseries and out plant them throughout the Keys. The plan also includes strategies for protecting climate refugia by determining which coral species are most resistant to bleaching, and what locations are more likely to promote coral growth and avoid catastrophic damage from storms. Healthy corals can help protect vulnerable coastal communities from extreme storms, expected to increase with climate change.

Lessons learned: FKNMS' efforts illustrate the value of early and continuing involvement of the community and stakeholders in the management process to foster understanding and partnership while building support for necessary actions. In addition to robust science, effective climate change adaptation requires deliberate inclusive partnership and capacity building among MPA managers, stakeholders and the public. Ultimately, the successful adaptation to climate change in marine protected areas – including the wider sustainability benefits that this fosters – will hinge on this collaborative ability. The challenge is daunting but by following the example of MPA managers, like those in the Florida Keys, it is possible to ensure that our marine ecosystems, and the communities they support, have the best tools and options available for adapting to a changing climate and mitigating its impacts.

Next steps: Public comments on the initial draft of proposed activities are currently being reviewed. Based on these comments, NOAA may issue a revised management plan and propose a set of draft regulations to establish changes, followed by another round of public comments on the revised proposal. Meanwhile, partnerships to restore the reefs and engage local communities and businesses are ongoing.

Sustainable development of a coastal community, building on the benefits of a marine protected area

Torre Guaceto Marine Protected Area, Italy

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"At the beginning we were not happy [about the designation of the MPA], there was some conflict between us and the management body, but now we see it was worthwhile. To catch this amount of fish outside the protected area I need to work four times as much. Working as we do here [i.e. under the rules established by the fishing protocol] allows us to obtain a higher income in the future, and to give work to our children. Small-scale fishing is not profitable anymore. We can continue to do this job only thanks to the protected area. Without the protected area we would have stopped doing this work a long time ago." [71]

– Fisher of Torre Guaceto, September 2010 –

"Since the Torre Guaceto natural reserve was created, we're very happy. We work inside the protected area once a week, and on other days we can fish elsewhere. We use very wide meshes, to give small fish the opportunity to escape, so that we only catch the largest fish."

– Fisher of Torre Guaceto, June 2019[72] –

Background: The Torre Guaceto Marine Protected Area (south-eastern Italy) includes both marine and terrestrial areas. The marine protected area (MPA) includes 179 ha of no access-zone (zone A), 163 ha of no-take but access buffer zone, used for guided tours, bathing and research activities (Zone B), and 1,885 ha that can be used for small-scale fishery under restricted conditions (Zone C). The terrestrial protected area covers 1,100 ha, 73 per cent of which is agricultural land and is mainly used to produce tomatoes, artichokes and olives. The marine protected area of Torre Guaceto is also included in a Site of Community Importance (SCI) under the Habitats Directive (7,978 ha, 95 per cent of which are marine).

Sustainability challenge: Before designation, there was no control of overfishing, and illegal fishing and blast fishing were common, leading to significant ecosystem degradation. Local visitors used to leave behind significant amounts of litter, which was not collected, and there was no organic agriculture. In general, the area was characterised by high levels of unemployment, criminality and a large shadow economy.

Key benefits: Various studies document an increase in size and density of fish target species after the designation of the Torre Guaceto MPA.[73, 74, 75] This translates into economic benefits to the local fishers.[76] The average catch per unit effort (CPUE)[1] in Torre Guaceto is reported to be almost two

[1] CPUE is often used as an indication of the abundance of a target species of fish. It is calculated by dividing the average catch by a measure of effort (e.g. number of hours or km of net employed).

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Co-benefit SDGs

3 GOOD HEALTH AND WELL-BEING

8 DECENT WORK AND ECONOMIC GROWTH

11 SUSTAINABLE CITIES AND COMMUNITIES

13 CLIMATE ACTION

Daniela Russi (Institute for European Environmental Policy).

Institute for European Environmental Policy

Case study

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times higher than the CPUE near the MPA.[77] For some species, the CPUE inside the MPA is much higher than outside. For example, the CPUE of the scorpionfish, the most common catch inside the MPA, was 3,875 kg per km of net inside and 544 kg outside the MPA. The CPUE of the striped red mullet was 1,754 kg per km of net inside the MPA and 392 kg outside. The conservation measures also brought about a recovery of macroalgal communities, which harbour hundreds of species of invertebrates and algae. This is due to a reduction in the population of urchins, which are the most important alga grazers and are predated by seabreams, whose density increased due to the fishery protection measures.[78,79] The conservation measures benefit a much wider area than the MPA itself, thanks to the movements of eggs and larvae towards non-protected areas to at least 200 km southward.[80, 81, 82, 83]

The strong collaboration between the managing body and the fishers increased their awareness of the importance of sustainable fishing practices. For example, they now use the 30 mm-mesh net that is required inside the MPA even when they fish outside, where the legal minimum mesh is 22 mm. They do so to avoid capturing juveniles and thereby to not interfere with reproduction.

While there was no tourism in Torre Guaceto before the designation, the number of visitors from other regions and countries increased considerably over the last decade. As a result, new livelihood opportunities have arisen for the members of the local community owning or working in hotels, restaurants and bed and breakfasts, and for those working as personnel of the protected area, tourist guides and environmental educators.

Finally, the managing body and the grassroots organisation Slow Food are encouraging farmers inside the protected area to switch to organic farming – at the moment about 30 per cent of the area is organic land or in conversion to organic, and this share is rising because farmers are increasingly realising that they can get a premium price for organic products.

Conservation solution: In order to overcome the initial resistance of fishers to the MPA, the managing body involved them in the elaboration of a fishing protocol to define fishing activities inside the MPA. Key to the success of this initiative was the involvement of Slow Food, who mediated between fishers and the managing body, and of ecologists from the University of Salento. An adaptive management approach was chosen, meaning that the fishers agreed that the rules could be changed if a reduction in fish biomass were observed during the regular monitoring activities carried out by the managing body.

In addition, the managing body has been raising funds to support the resident fishers. For example, a grant from an Italian foundation called *Con il Sud* financed the purchase of new, more sustainable nets and a one-year project financed by *Federparchi*, the association that represents the managing bodies of Italian protected areas, remunerated fishers to reduce their fishing effort by 35 per cent, in order to test the impact of such a change on the fish stocks in the MPA.

The managing body and Slow Food engaged in frequent communication and collaboration with the agricultural landowners too and gained their support by convincing them of the economic advantages of the Torre Guaceto brand, which allows a premium price for agricultural products and synergies with the tourism sector.

A wide range of educational, sport, gastronomical and cultural activities have been organised by the managing body

and Slow Food. These initiatives attract an increasing number of visitors from other regions and countries, who create a demand not only for tourism services, but also for food products with the Torre Guaceto brand. In addition, Slow Food gave its label (called Presidium) to three Torre Guaceto products: fish, an ancient variety of tomato called *pomodoro Fiaschetto* and the extra virgin olive oil *Oro del Parco* (Gold of the Park). Presidia are labels that Slow Food grants to sustainable, traditional and seasonal food. They increase the reputation, and hence the demand, of Torre Guaceto's products and allow producers to sell at a premium price. They also provide free publicity to the restaurateurs using them, who are often involved in Slow Food events and initiatives, such as the Slow Food's Chefs' Alliance, a network of chefs who commit to use at least three Slow Food Presidia. The Presidia also help attract visitors interested in high-quality gastronomy. They are promoted in the events organised by Slow Food and the managing body, they are used in the café in the Torre Guaceto's lido and sold in the visitor centre (only *Pomodoro Fiaschetto* and *Oro del Parco*, not the fish).

Business case: The fishery rules increased the fish density and size inside the protected area, resulting in a higher income for resident fishers. The daily net income provided by a working day inside the MPA is reportedly double that which can be obtained outside (€140 versus €70 per day).[84]

Since the designation of Torre Guaceto, a significant number of bed and breakfasts have been established, and local rural farmhouses have been renovated to be rented to tourists. In 2013, there were 127 tourist structures, only 29 per cent of which were hotels (more recent data are not available). Between 2008 and 2013, the number of tourist structures increased by 78.8 per cent. The increase in tourism led to new livelihood opportunities for the local community. In 2015, it was calculated that the cooperative managing the educational and leisure activities in the area, the local diving and sailing associations, generated 128 jobs and a gross income of €187,000.[85] The beach of Torre Guaceto generates an income of more than €6 million per year, including meals, accommodation, parking, purchase of local products and other goods and services.[86]

Lessons learned: Lessons learned from the case study include the following:[87]

- Early engagement of and support to stakeholders can improve buy-in and result in high levels of environmental enforcement. In addition, adaptive management, which allows restrictions on resource use to be modified if variations in the state of ecosystems are observed, is key to ensure long-term sustainability and it motivates stakeholders to respect the rules.
- Synergies between agricultural/fishery stakeholders and the tourism sector, based on the sustainable use of natural resources and the conservation of ecosystems, can bring about benefits for all involved economic sectors.
- Labels can enable the creation of synergies between producers and the tourism sector.
- Successful marine protected areas can play an important educational role to stimulate sustainable behaviour.

Next steps: The managing body and Slow Food are working on the development of a new app for mobile phones to enable fishers to directly sell to restaurants (potentially getting a higher price than when selling to fishmongers). In addition, they are trying to set up the production of processed food from the protected area, including fish cooked in Torre Guaceto's tomato sauce and preserved in the Torre Guaceto oil. Other ideas to provide complementary sources of income to fishers without increasing their fishing effort include exploring the potential for pescatourism (i.e. the organisation of boat tours by fishers) and organising activities to attract visitors outside of the summer tourist season (e.g. sailing courses).

This case study was based on a site visit by the author in October 2017, plus scientific papers and reports.

Case study

Area-based marine conservation as a means to strengthen climate resilience

Belize Barrier Reef System World Heritage Site, Belize

Co-benefit SDGs

Maja Murisic and **Gianni Ruta**, (The World Bank Group).

Background: The Belize coral reef is part of the world's second largest reef system, and the country contains the longest unbroken section of this reef, including a wide variety of coastal and offshore reef ecosystems. The area supports an enormous diversity of marine species, including the endangered West Indian manatee (*Trichechus manatus*) and green (*Chelonia mydas*), hawksbill (*Eretmochelys imbricata*), and loggerhead (*Caretta caretta*) sea turtles.[88] Around 26 per cent of Belize's terrestrial and marine areas are in protected areas and the reef system is recognised as a natural UNESCO World Heritage site. However, in the past there have been concerns that marine protected areas (MPAs) were not well integrated with the rest of the marine and terrestrial environment and local communities were not sufficiently involved in management decisions.[89]

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Image shows Healthy Reefs

Sustainable management and conservation of coastal zones is critical to Belize's economy. The livelihoods of fishers, other resource users and the tourism sector rely on these ecosystems. A decade ago, the value of the coral reefs and mangroves was estimated to be US$395-559 million a year[90] with 60 per cent of the population directly or indirectly dependent on goods and services from coastal and marine ecosystems.[91]

Conservation challenge: Despite their huge significance, the reef, seagrasses and mangroves are far from secure. Mangroves are under particular pressure and there has been widespread and unsustainable coastal development. The industries that the country relies on from an economic perspective – tourism, fisheries, real estate and agricultural industries – are also those that threaten the natural ecosystems that support these activities. These pressures are further exacerbated by observed and anticipated climate change impacts, including changes in sea surface temperatures, which are also associated with increasing frequency and intensity of tropical cyclones or hurricanes. In 2009, the Belize Barrier Reef Reserve System was added to the UNESCO World Heritage in Danger list partly due to risks from oil exploration and loss of mangroves, although it was removed again in 2018, following a moratorium on oil exploration across the whole Belize maritime zone and better forest protection.[92] But many pressures remain, for example to some of the fish populations.[93] The site was still rated as being of "*significant concern*" in IUCN's survey of natural World Heritage sites in 2020.[94] The need for an integrated approach to planning and managing marine resources is widely acknowledged.[95]

Conservation solutions: The Belize government adopted a comprehensive approach to management and planning.[96] The approach aimed to boost revenue to local stakeholders, for example from lobster fishing, increase the functional area of the reef and double the value of the coastal ecosystems for climate protection. The project used the InVEST model from the Natural Capital Project (a suite of free, open sources software models used to map and value the goods and services from nature) to inform the planning exercise.

Funding for part of the approach came from the Marine Conservation and Climate Adaptation Project (MCCAP) which is funded by the Adaptation Fund, and implemented by the World Bank. Belize ratified the Kyoto Protocol in 2003 making it eligible to access resources from the Adaptation Fund, which finances adaptation programmes in developing country Parties to the Kyoto Protocol that are particularly vulnerable to climate change. The *Belize Marine Conservation & Climate Adaptation Project* is a US$5.53 million project to implement priority ecosystem-based marine conservation and climate adaptation measures to strengthen the climate resilience of the Belize Barrier Reef System, among others. The project has three components: improving the protection regime of coastal and marine habitats, supporting viable and sustainable alternative livelihood options for reef users and raising awareness and building local capacity.

To date, this has supported expanding and securing MPAs, bringing the total coastal and marine area under protection from 13 per cent to 20.2 per cent of territorial waters (405,513 ha), and has expanded marine replenishment (no-take zones) from approximately 2 per cent to 3.1 per cent (58,699 ha) using a participatory approach.

The project has also supported development of mangrove regulations, which have subsequently passed into legislation and drafted a revision of the Coastal Zone Management (CZM) Act and Regulations. The target indicator for repopulation of coral reefs in replenishment zones has also been achieved, with six coral sites restored in each reserve (South Water Caye Marine Reserve and Turneffe Atoll Marine Reserve).

Business case: The adaptation, conservation and restoration activities applied in the Belize Barrier Reef System have both ecological and socio-economic significance, providing an opportunity for maintaining and potentially increasing the income level and marine resources available for an estimated 203,000 people living in the coastal areas. These activities will also significantly enhance the ecosystem functionality, resilience and capacity to adapt to increasing climate change impacts.

Lessons learned: The project so far has been broadly successful; it has in some ways gone further than expected in terms of designating new marine reserves and influencing mangrove conservation efforts. Through productive partnership and collaboration with fishers and community organisations, the Project has empowered them to find jobs that deliver direct benefits while protecting reefs, mangroves, seagrass and tidal marshes. In fact, the project approach turned out to be critical: not only restoring and conserving biodiversity but also supporting diversification of livelihoods, to ease pressures on ecosystems and secure environmental protection. Through this partnership, Belize is better preserving its marine environment, increasing resilience to climate change and supporting sustainable livelihoods of those who depend on this natural resource – thereby also setting a strong foundation for the country's transition to a blue economy.

Specific lessons from the project implementation included the importance of placing an emphasis on early development of the subprojects' proposals, related business plans and required social and environmental safeguard documents, as well as carefully considering and sequencing those activities that require lengthy national processes for obtaining necessary permits and approvals from various local organisations and agencies. The strategy and measures taken to address these challenges, such as capacity development efforts and skills training, proved to be critical for the success of the project. The project shows how important it is to have an integrated approach to coastal management and the blue economy vision for the country and link it to further needs specific to MPAs.

Next steps: Given the successful experience and lessons learned, it will be important to build on the insights of the Project and scale up its reach.

Information linked to this case study can also be found through the PANORAMA initiative.

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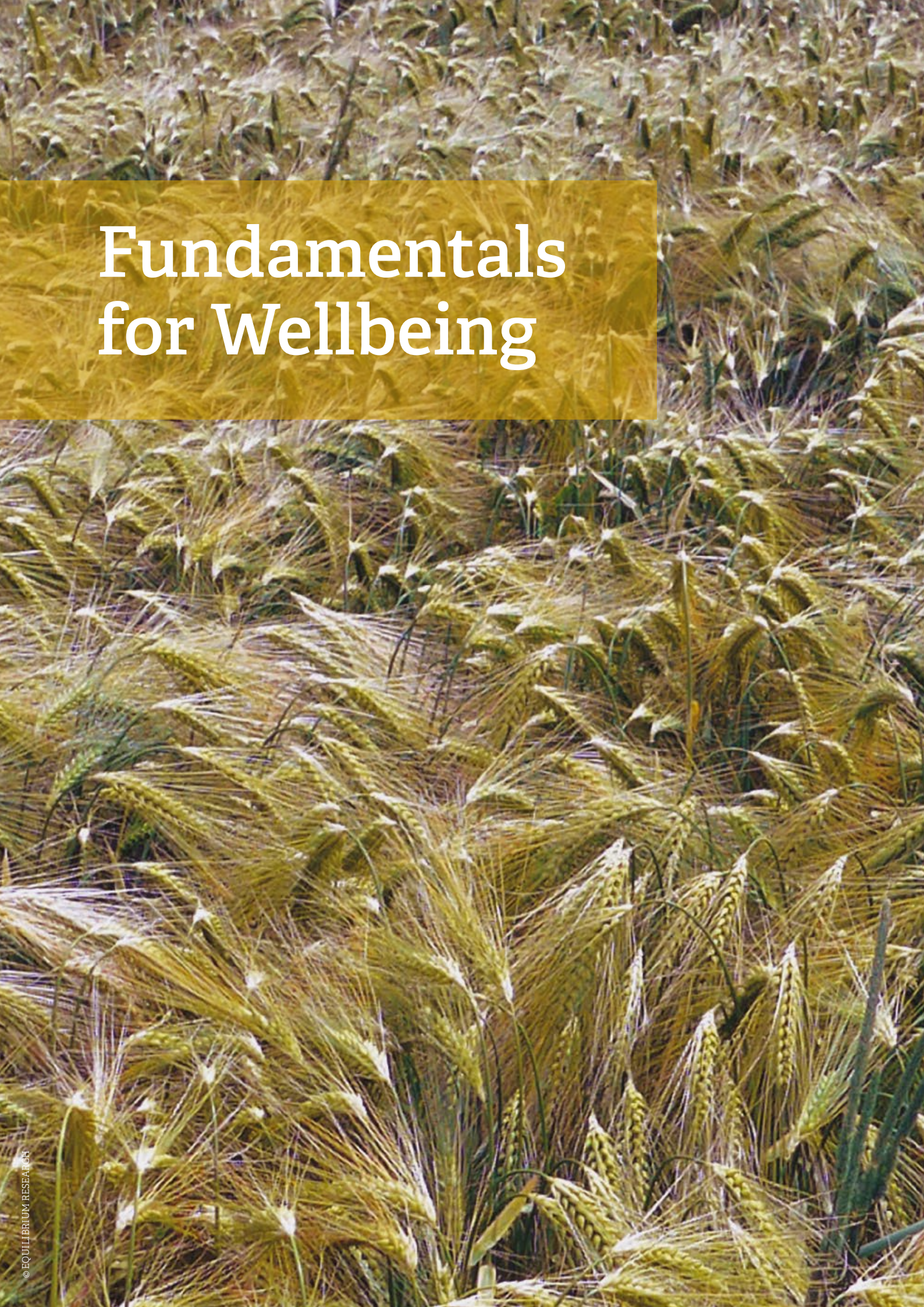
Fundamentals for Wellbeing



SDG 2: Zero hunger

Summary for policy makers

There is currently enough food to feed the whole world, although unequal distribution means a billion people go hungry. Food security will decline as population grows and productivity fails to keep pace. Farming has become more productive but less sustainable. Problems include agrochemical pollution, land degradation, loss of pollinators, a declining genetic base, overfishing, food waste, climate change and a shift to inefficient foodstuffs, primarily meat. Local food security is threatened in many countries by loss of livelihoods for small farmers. These all impact negatively on many other SDGs. Effective area-based conservation offers a range of approaches to boost food security in line with SDG 2 by:

- Maintaining populations of species collected from the wild, particularly fish
- Supplying ecosystem services such as water for agriculture
- Regulating water flows to avoid floods and various forms of disaster risk reduction
- Conserving wild species supportive of agriculture such as pollinators and pest predators
- Stabilising and rebuilding soil and associated beneficial soil organisms in protected landscapes
- Conserving crop and livestock wild relatives needed for breeding programmes
- Maintaining cultural ecosystems with traditional agriculture and grazing
- Integrating these benefits into national and global strategies means building links with relevant UN bodies, donor agencies, government policy makers and agribusiness companies.

What is the challenge?

Since 1945, global food production has kept pace with human population growth through a mixture of increased productivity[1] and the conversion of natural ecosystems to crop or livestock production.[2] The conversion of natural ecosystems has also been a major cause of biodiversity loss.[3] Productivity gains have been greatest in cereals, oilseeds, fruits and vegetables, with an estimated 47 per cent increase from 1985-2005 due to higher yielding varieties, less crop failure, and multiple annual cropping.[4] Cropland increased only 2.4 per cent over this period.[5] Sadly, a combination of poverty, poor food distribution, food waste, agricultural inefficiency and the politics of agribusiness mean that 800 million people still go hungry.[6] The second sustainable development goal needs to start by looking at equitability of access to food,[7] with close links to SDG 10.

But achieving longer term food security, which lies at the heart of SDG 2, is more complicated. Several challenges come together.[8] Aspects of agricultural intensification have ecological and health impacts that threaten to undermine food production. These impact negatively on other SDGs, particularly those addressing clean water (SDG 6), climate (SDG 13) and life in water and on land (SDGs 14 and 15). Projections on rising population and future agricultural productivity also suggest there could be real food shortages within a few decades,[9] and need for further land conversion.[10] Farming has become more productive but less sustainable,[11] and is exceeding planetary boundaries for stressors such as nitrogen levels.[12] We risk undermining our own food production systems just when we need them more than ever, and causing a lot of collateral damage in the process.

Fertilisers boost crop yields, but inefficient use[13] creates air and water pollution. Surface and groundwater are affected along with marine areas, where over 500 eutrophication dead zones are now known.[14] Nitrous oxide is an increasingly important greenhouse gas, with emissions largely from agriculture.[15] Reactive nitrogen from our own activity exceeds that from natural processes.[16] Environmental impacts of pesticides are often underestimated,[17] especially in the tropics,[18] with concerns about serious declines in insects.[19] German researchers measured a 76 per cent decline in flying insect biomass in 63 nature reserves over 27 years.[20] This has knock-on impacts on food production. The total economic value of pollination worldwide is estimated at US$165 billion annually,[21] but in parts of China farmers now pollinate fruit trees by hand due to the loss of insects.[22] Use continues to increase, and many farmers feel trapped into a cycle of ever increasing applications.[23] Herbicide-resistant genetically modified crops receive 56 per cent of total glyphosate use[24] and increased herbicide tolerance means that farmers are likely to increase the application rates even more.[25] At least 20 per cent of irrigated lands are believed to be impacted by salinisation from poorly designed irrigation schemes, with some estimates putting the figure much higher.[26] Researchers suggest that half of all arable land will be affected by 2050.[27]

About 75 per cent of crop genetic diversity was lost in the 20th century due to abandonment of traditional landraces.[28] While modern crop varieties are often more productive, their narrow genetic base reduces their ability to react to environmental change. Further, many crop wild relatives (CWR), which form genetic resources for breeding, are threatened,[29] and 70 per cent of important CWR need protection.[30] Pests and disease continue to take a heavy toll on crops worldwide,[31] with problems increasing due to climate change, which amongst other things helps pests and pathogens spread to new areas.[32]

Around 1.3 billion people live on degrading agricultural land.[33] The *Status of the World's Soil Resources* report identified: "*the risk that the degradation of soils will strongly impact ecosystem services and in turn production if soil sustainable management practices are not adopted*".[34] The Economics of Land Degradation Initiative estimated that loss of ecosystem services due to land degradation cost US$6.3-10.6 trillion annually; 10-17 per cent of the world's GDP.[35]

In the oceans, 33 per cent of marine fish stocks were harvested at unsustainable levels in 2015,[36] while ocean acidification has increased by 30 per cent since the start

Grazing in Armenia privately protected area.

of the Industrial Revolution, with profound implications on marine life.[37]

Paradoxically, both food demand and waste are increasing with growth of population and average income.[38] One-third of food is estimated to be wasted, equivalent to food grown on an area larger than China, with a cumulative carbon footprint of 3.3 Gt of CO_2 equivalent/year, making food waste the world's third largest carbon emitter.[39] Dietary change is driving agricultural expansion as consumers demand land-intensive food, particularly processed foods and meat.[40] Demand for meat and livestock feed is expected to rise by almost 50 per cent by 2050.[41] Nutrition from meat requires about five times more land than plant-based equivalents,[42] with beef needing a massive 28 times more land and 11 times more irrigation water than livestock such as pigs and poultry.[43]

Competing land uses – including for biodiversity and ecosystem services, urbanisation,[44] infrastructure, tourism and energy[45] – reduce the area available for food.[46] Land grabbing undermines food and nutritional security as well as smallholder tenure and resource rights in poor and vulnerable communities. Climate change is expected to reduce crop yields in many countries,[47] due to both long-term shifts in climate and more incidence of extreme climate events,[48] while agriculture is also a major source of greenhouses gases.[49]

Food production is also becoming more centralised, and larger scale: traditional growers and small farmers are being pushed out of business.[50] While this might put more food into the global food market, it can undermine food security for some of the poorer members of society, who have been relying on subsistence or near subsistence living on poor land and have neither the funds nor the access to monetised food sources.

Addressing the Zero Hunger SDG therefore involves a mixture of political, technological, ecological and personal change. Reducing meat consumption is generally recognised as the quickest and most direct way of increasing food security.[51] Addressing some of the major inequalities in distribution and access to food will involve a mixture of technical advances, for example in food storage, along with political and governance changes to reduce inequality, corruption and criminality. All these are critically important but beyond our remit here. But there are many other issues, related to the long-term environmental stability of food production, access to water, maintenance of wild fish stocks and defence of the poorest and most vulnerable subsistence communities, where protected and conserved areas have a positive role to play.

How can effective area-based conservation help?

In 1996, the World Food Summit agreed that: "*Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life.*"[52]

SDG 2 has several targets that relate directly to values captured by area-based conservation. Target 2.4 seeks to "*ensure sustainable food production … and … resilient agricultural practices, that help maintain ecosystems, that strengthen capacity for adaptation … and progressively improve land and soil quality*". Target 2.5 is to: "*maintain the genetic diversity of seeds, cultivated plants and farmed and domesticated animals and their related wild species…*", while Target 2.3 has a broader social remit and relates to protection of "*small-scale food producers, in particular women, Indigenous peoples, family farmers, pastoralists and fishers*".

Protected areas and OECMs can help address hunger and strengthen food security first by maintaining wild food stocks, along with a range of ecosystem services that support the collection and cultivation of food species. More subtly, some protected and conserved areas also provide spaces in which threatened peoples and cultures can continue to access food in traditional ways.

The Food and Agriculture Organization of the United Nations (FAO) has coined the term "biodiversity for food and agriculture" (BFA) to describe the multiplicity of ways in which ecosystem services support food security, including:

- Viable populations of species collected from the wild, particularly freshwater and marine fish;
- Ecosystems supplying reliable water and various forms of disaster risk reduction;
- Wild species supportive of agriculture such as pollinators and pest predators;
- Soil and soil organisms;
- Crop and livestock wild relatives; and
- Cultural ecosystems with traditional agriculture and grazing.[53]

FAO recognises the need for conservation in addressing the SDGs, identifying enhancing soil health, restoring land, protecting water, mainstreaming biodiversity conservation and protecting ecosystem functions amongst critical steps towards achieving SDG 2.[54]

Marine protected areas, freshwater protected lakes and rivers, locally managed marine areas and other wetland areas set aside from major exploitation all play a key role in maintaining fish populations important for subsistence and commercial fishing. Effective area-based conservation approaches in wetlands create sheltered conditions that help to enhance fish breeding, prevent habitat damage and facilitate ecosystem recovery. As fish stocks build up inside reserves, juvenile and mature fish move out to populate nearby areas, where they can be fished. Reserves boost fish populations in several ways. They conserve fish of all ages; overfishing tends to remove older members of the population, but bigger fish generally produce many more eggs and are disproportionately important for breeding. Some species, especially those with no or only limited powers of movement (e.g. oysters, clams or abalones), only reproduce successfully at high population densities so need undisturbed habitat. Reserves also ensure that species are protected at vulnerable stages of their life cycle, particularly in fish nurseries and spawning grounds.[55] A review of 112 independent studies in 80 different MPAs found strikingly higher fish populations inside the reserves compared with surrounding areas,[56] and well-managed MPAs were shown to be highly beneficial in replenishing fished populations.[57]

The role of ecosystems in supplying reliable freshwater for agriculture is discussed under SDG 6. The stable ecosystems within protected areas and OECMs also help to reduce the impacts of several climate-related disasters that can disrupt food supplies, including reducing erosion, sandstorms and desertification in drylands,[58] and reducing flood events through maintenance of natural floodplains and the buffering effect of riparian vegetation.[59]

A third critical agricultural benefit is in maintaining populations of supportive wild species: particularly pollinators, species that prey on pests and soil organisms. Even quite small reserved areas can in some circumstances help to boost numbers of pollinators and pest predators, as shown by research into leaving unsprayed edges around agricultural fields,[60] although these do not meet the criteria to be protected areas. Recent experience of decline in insect biomass suggests that larger scale protected areas will be needed in more places, along with changes in management in the wider landscape, possibly through judicious use of low input farming areas that might themselves be classified as OECMs. Protected areas also help to conserve and where necessary rebuild some of the basic necessities of agriculture, including healthy soils, and carefully sited set-asides can provide critical roles in soil stabilisation in drylands[61] and other areas prone to erosion.

Crop wild relatives (CWR) are species closely related to domesticated crops, which contain genes useful for crop breeding and adaptation (e.g. drought and pest resistance).[62] No global estimates of total numbers of CWR exist as yet, although a recent study documented 1,076 taxa associated with 81 crops,[63] this is only a partial count. The diversity of CWR has decreased overall,[64] particularly in marginal areas experiencing changes in climatic conditions. Protected areas provide tools for CWR conservation but are relatively lacking in some of the ecoregions with the highest number of CWR.[65] However, over 2,000 crop wild relative species are subject to conservation in situ,[66] sometimes in micro-reserves established especially for this purpose and sometimes as an additional benefit of conservation originally with more general aims.[67]

Livestock wild relatives in theory have similar uses for livestock breeding[68] although this is relatively under-utilised at present, despite recognition of a serious decline in genetic diversity within some livestock.[69] The need for adaptive breeding is likely to increase under conditions of rapid climate change.[70] Overall they are more threatened than wild mammals and birds in general: 83 per cent of relatives of cattle, 25 per cent of chicken, 44 per cent of sheep and goat and 50 per cent of pigs are endangered, and for instance the African wild ass (*Equus africanus*) and the wild Bactrian camel (*Camelus ferus*) are critically endangered.[71] Their status has received much less attention than for CWR, and livestock wild relatives are far less used in breeding programmes.[72] Wild relatives may however cross-breed accidentally with domesticated livestock,[73] for example with jungle fowl[74] or wild pigs. In many cases protected areas provide critical options for survival.

Finally, many national systems of protected areas include substantial areas of cultural landscapes; areas that have been managed through traditional agricultural systems for hundreds or thousands of years and have developed significant associated biodiversity. Here the emphasis is less on maximising production per unit area, but is more focused on the social and cultural aspects of keeping old farming traditions alive and supporting sustainable food production systems in areas where no alternatives exist, and where collapse of these systems will directly impact people's food security and wellbeing. In long-settled parts of the world, whole ecosystems exist where associated species have become reliant on the conditions created by traditional agriculture; for example many Mediterranean habitats,[75] temperate heath, meadows and lowland moors.[76] Modern agriculture has often moved on from these practices, which are less economic, sometimes necessitating inclusion and support in protected areas. Protected landscapes (IUCN category V protected areas) often include both traditional agriculture and grazing areas, and these will likely be even more common within OECMs. Such areas can also support important biodiversity.[77] Integration of nomadic pastoralism into the management strategies of protected and conserved areas is one important aspect and is for instance increasingly discussed within UNESCO World Heritage sites.[78]

Locally ‚managed marine mine in Samoa

Approaches that support SDG 2

Many – perhaps most – protected areas and OECMs will offer something towards food security and thus can be part of an overall response to the remit of SDG 2. But some types of area-based conservation have special roles to play. Integrating these benefits into national and global strategies means building links with relevant UN bodies, donor agencies and agribusiness companies. Some of the most important opportunities are outlined below, along with factors that will help give optimum results:

Protected areas

- **Terrestrial protected areas maintaining water and climate services**: play a key role in agriculture, by providing water for downstream irrigation or through their role in stabilising local and global climate. Some of the benefits manifest far from the protected area itself; for example transpiration from Amazon trees creates the climatic patterns that facilitate agriculture further south in Argentina and Uruguay, known as the "flying rivers" of the Amazon.[79]
- **Micro-reserves for crop wild relatives**: many crop wild relatives are primary colonisers or weed species and require disturbed ground to grow, which means that they require a certain amount of management to sustain them in a small protected area. Micro-reserves have been developed to protect targeted CWR, where land is managed so that these particular species can survive,[80] such as wild relatives of wheat (*Triticum* spp.) in Armenia.[81]
- **IUCN category V protected landscapes and seascapes**: the fifth IUCN protected area management category is: *"where the interaction of people and nature over time has produced an area of distinct character with significant ecological, biological, cultural and scenic value: and where safeguarding the integrity of this interaction is vital to protecting and sustaining the area …"*.[82] Optimising protected landscapes and seascapes: successful category V protected areas are based on planning that covers the entire area and considers how the various management approaches within the

protected area can be integrated to provide optimal benefits to both biodiversity conservation and food security.

- **Protected areas incorporating pastoralism and grazing**: low-level livestock grazing, including transhumance and nomadic pastoralism, has been successfully incorporated into the management strategies of many grassland and savannah protected areas, including within natural World Heritage sites.[83] These places help support traditional communities alongside delivering conservation.
- **Marine and freshwater protected areas**: have a key role to play in protecting fish stocks, and other harvested species. *Optimising MPAs*: There is strong evidence to suggest that MPAs under the stricter IUCN management categories are the most effective[84] although pressure from fishing and tourism interests frequently limits these in number and area covered.

OECMs

- **Marine OECMs**: will also sometimes provide ancillary protection for fish and other species that are important for commercial or subsistence fishing. Examples might include wrecks and other war graves, exclusion zones around wind farms, military exclusion zones, etc.[85]
- **Terrestrial OECMs incorporating food production**: some OECMs will consist of or include areas of low intensity grazing on natural pasture, organic farms and other forms of agriculture that include a major focus on wider ecosystem services.

Key complimentary approaches

Another specialised designation is important in marine areas:

- **Locally Managed Marine Areas** (LMMAs): an LMMA is an area of nearshore waters and its associated coastal and marine resources that is largely or wholly managed at a local level by the coastal communities, land-owning groups, partner organisations, and/or collaborative government representatives who reside or are based in the immediate area.[86] Many but not all will contain permanent or temporary set-aside areas;[87] set-asides are generally an important part of sustainable management.

The World Heritage Laurisilva forests of Madeira play a predominant role in maintaining the hydrological balance across the Island; assisted by the 'Levadas' a system of channels and aqueducts which transport water to agricultural areas.

Case study

Protecting crop wild varieties for food security

The Potato Park, Peru

Co-benefit SDGs

Nigel Dudley and **Sue Stolton**, (Equilibrium Research and IUCN WCPA).

Background: The Potato Park, near Cuzco in the Peruvian Andes, is a self-declared protected area, developed and managed since 1992/4 to conserve traditional landraces of potatoes and other Andean tubers. The park covers 9,872 ha, and contains six predominantly Quechua-speaking communities, with a current population of 7,444 people. Most of the area is farmed, with land divided into three ecological levels: the lowest is devoted to cereals, the middle to Andean tubers and the highest ecological level (at an altitude of 4,350 metres) to potatoes. In the highest areas, agriculture follows an eight-year rotation; one crop followed by seven years fallow. Along with potato diversity, the Potato Park also consciously protects Quechua traditions, dress and culture, along with food security and sovereignty. People follow the Quechua philosophy of three intersecting realms (Figure 2.1) and every day's work starts with offerings of coca leaves.

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Sustainability challenge: Changes in agriculture, such as the introduction of high yielding varieties, have led to losses of traditional crop varieties ("landraces"). The Food and Agricultural Organization estimates that 75 per cent of crop genetic diversity was lost over the last century.[88] Many landraces offer benefits such as resistance to drought, cold or disease. Today, the bulk of this genetic diversity is maintained by traditional agricultural systems. Additionally, many crop wild relatives (CWR) of domesticated plants are also threatened.[89] Landraces and CWR are critical for crop breeding, which is increasingly important in the uncertain conditions created by climate change. CWR of potatoes (*Solanum* spp.) have been used to improve cultivated varieties since the 1900s, when genes from the Mexican *S. demissum* helped to breed resistance against potato blight.[90] The park protects more potato varieties than anywhere else on the planet. It is the centre of origin of three potato crop wild relatives and supports 1,377 potato varieties, along with 92 other Andean tubers.

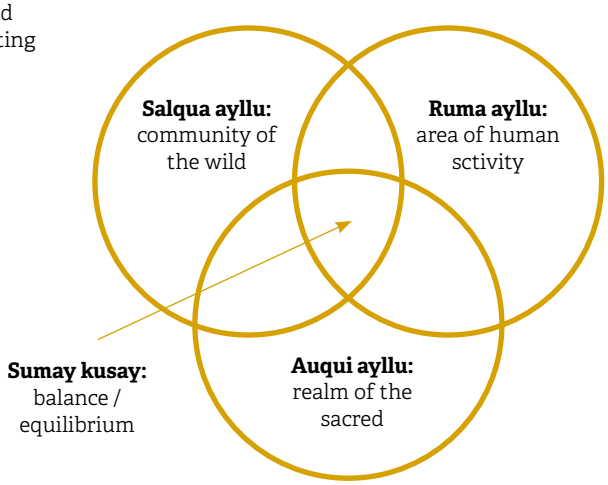

Figure 2.1: Qechua philosophy and three intersecting realms

Conservation solution: Community members undertake crop breeding, particularly coloured potatoes with important medical properties. Farming is organic, using hand tools due to steep conditions; alpaca manure is important. The main effort is in maintaining varieties in the field; but there is also greenhouse cultivation, where landraces are hand pollinated to avoid cross breeding. In 2015 the community sent seeds to the global seed storage facility at Svalbard, Norway, providing triple security: in the field, on the site and in long-term storage. Over 500 varieties have been given to communities in Peru to help them to adapt to new climatic

conditions and help to maintain the wealth of potato varieties. Some potatoes are treated for long-term food storage (up to 20 years), important for years when yields are low, and all are used in multiple food and drink products.

Sustainability measures in place: The park is working to adapt potatoes to climate change; community members have been trained to undertake monitoring and collaborate with scientists and agronomists. Native potatoes are found to be more resilient. Warmer weather means more crops (e.g. beans) can be grown and potatoes grown at higher altitudes. But pests are also commoner at lower altitudes, forcing farmers to grow higher: there are therefore currently both gains and losses as a result of climate change to date. Transects and insect traps measure changes in pests, timing of frost and experiments with calcium additives. Motivation is high, and members of the community are proud that their local actions are providing a national, and global, contribution to food security.

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Selling local pproducts at the Potato Park

Business case: The Potato Park is not a conventional case in that most of the community are still largely and deliberately outside the cash economy, existing by subsistence and barter. Some cash is raised through sale of medicinal plants, artisanal products, a restaurant, guiding and tourism. Different communities take charge of different aspects. Money raised is used to maintain infrastructure, for production of materials and for community use, plus celebration of International Potato Day on 30 May. Annual community meetings determine use of funds and the various communities within the park benefit depending on the amount of time spent on community activities during the year.

Lessons learned: The Potato Park has shown that dedicated community action can help to do what many governments have failed to achieve in terms of maintaining crop diversity. Integration of traditional ecological knowledge and Western science knowledge has proved an important benefit. The presence of a supportive NGO has also been critically important in maintaining enough funding for the necessary investment (in greenhouses, travel to conferences, essential equipment, etc.).

Next steps: Community members are still trying to get official recognition within Peru as a protected area (IUCN category V, protected landscape), in large part to reduce risks of being targeted by mining companies. Secure funding remains a challenge and there are concerns about the potential for introducing GM potatoes into Peru and consequent contamination of their genetic resource. They are working with other groups in Peru (for maize) and globally (e.g. Bhutan, Kyrgyzstan) on a 15-20-year vision to develop similar models of genetic crop preservation with working communities.

This case study was based on a site visit by the first two authors in October 2019, plus written material and input from the Andes Organisation and members of the Potato Park Community.

Information linked to this case study can also be found through the PANORAMA initiative.

Case study

Growing coffee to restore rainforest and local livelihoods

Gorongosa National Park (GNP), Mozambique

Co-benefit SDGs

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Andrea Egan and Midori Paxton (UNDP), based on existing literature.

Background: Gorongosa National Park (GNP) in Mozambique is the site of one of Africa's greatest wildlife restoration initiatives.

Established in 1960 due to its importance as the habitat for some of the densest wildlife populations in Africa, GNP was touted as one of Africa's most spectacular national parks, with massive herds of charismatic megafauna roaming its Rift Valley grasslands and woodlands. But for 15 years, during Mozambique's brutal post-colonial civil war (1977-1992), hostilities raged in and around the park, devastating human and wildlife populations alike.

Sustainability challenge: Wildlife populations declined by 90-99 per cent between the mid-1970s and the late 1990s, due largely to hunting by military forces and continued to decline thereafter due to post-war poverty. Aerial wildlife counts and anecdotal reports from local communities noted a near-total collapse of wildlife.

A generation after the civil war, more than 100,000 large animals now populate GNP. But a resurging animal population can sometimes be a source of human–wildlife conflicts. And bolstering ecosystem protection without ensuring sustainable livelihoods for nearby people can be a recipe for friction, jeopardising long-term sustainability for both nature and people. Therefore, "a common vision of the integrated relationship between sustainable land use, community development, and biodiversity" is key to the long-term viability of the area.

Key benefits to sustainability: The introduction of alternative livelihoods to the area, such as shade-grown coffee plantations and tourism development, has the potential to improve incomes for buffer zone households, and generate environmental benefits such as biodiversity preservation and habitat conservation. Increased income can spill over to other social benefits and positive externalities. Studies have shown that the children of certified shade-grown coffee farmers have significantly higher educational levels than those of non-certified ones, and

certified farmers were more likely to be members of relevant trade unions.

Conservation solution: In 2008, a Global Environment Facility (GEF) financed, UNDP-supported project joined the ongoing work of maintaining GNP – bolstering efforts to return the ecosystem to its pre-war state while lifting surrounding communities out of poverty.

Joining the fruitful partnership between the Government of Mozambique, the Carr Foundation and The Gorongosa Restoration Project, the UNDP GEF project objective was to strengthen the overall effectiveness and sustainability of Mozambique's protected area system, including financial sustainability. Following the 2008-2016 project, there is currently a follow-up project that started in 2018.

This ongoing support is continuing to ensure that some of Mozambique's most vulnerable people are able to benefit from inclusive, equitable and sustainable management of natural resources and the environment. This support also ensures that the conservation of globally threatened species is strengthened through enhanced protection and expanding community development around protected areas.

Gorongosa Mountain provides perennial surface water to the park area in the African rift valley and was incorporated into the protected area some years ago.To ensure symbiosis between conservation measures and development efforts, the GNP administration spearheaded an innovative community-based pilot project on the slopes of Mt Gorongosa. The pilot project was the first in the region to use a fully integrated approach to ecosystem conservation and restoration, bringing together a network of social development interventions in health and education, coordinating with local stakeholders on natural resource management, and improving livelihoods whilst simultaneously propagating indigenous trees in the project area via the project's centrepiece: shade-grown coffee farming.

An additional consideration is the backdrop of intense conflict in the mountain region, which extended the timeline of the pilot project by two full years. The results on the ground for the five-year pilot project, and the first year (2019/2020) under widespread adoption of the initiative by the community include: development of an area of 100 ha into high quality shade-grown Arabica coffee plantations, over 100 ha of rainforest was protected and restored, and payments were tendered for early adopters of high quality coffee. This initiative is currently generating sustainable livelihoods for over 600 local families. The project is actively growing at 100 hectares and 100 new families per year. The target is to reach 1,000 ha over 10 years, so as to build capacity within the local economy, to upskill programme participants, and change minds and attitudes towards key human rights (keeping girls in school, ending child marriages) and conservation challenges (stopping uncontrolled burning, shifting agricultural practices, and de-prioritising subsistence methods compared to less risk-prone agricultural practices). These new changed attitudes, and sustainable livelihood alternatives (combined with lasting peace in the region) will help to protect 30,000 ha of one of Mozambique's – and indeed the world's – most biodiverse ecosystems.

By upskilling farmers and implementing interim agroforestry alternatives such as honey production, coupled with the establishment of a small coffee processing factory in the nearby town, the project smoothed the transition from unsustainable, permanently shifting cultivation to sustainable, stable environment-protecting livelihoods.

Business case: It has been estimated that farmers' incomes in the GNP area have increased 10-fold on average for the more than 600 households in the project area, without impinging on their ability to maintain kitchen gardens. Preserving wildlife is also an important value proposition; living elephants are worth approximately US$1.6m apiece – a figure 76 times greater than the one-time sale of its tusks. The thriving national park gives growth opportunities for local tourism businesses, and intact

Case study

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ecosystem services represent savings to health systems and infrastructure.

Lessons learned: Just as ecosystems are intricately linked via webs of mutual aid, the measures implemented to preserve the ecosystems must account for the intimate relationships between local people and their environment. The case of GNP has highlighted that conservation measures which decrease local quality of life are destined to be short-lived; livelihood projects which unsustainably exploit the environment are similarly doomed. Well-integrated endeavours that harmonise considerations of livelihood and environment, such as the GNP coffee project, are more robust, resilient and sustainable.

Next steps: To promote community-based conservation, the current UNDP-supported, GEF-financed project is expanding protected areas through community conservancies and targeted rural development action. The project is specifically working to ensure that wildlife and forest management plans are developed for three conservancies around GNP and in neighbouring reserves, namely Greater Gorongosa-Marromeu Landscape and the Niassa National Reserve.

The project is also working to train members of conservancies and relevant co-management entities in wildlife management – and continuing to support sustainable agriculture and forestry, and alternative income generation. As part of this effort, the project is also supporting pilot projects on community-based wildlife management, sustainable agriculture, ecosystem restoration and the development of small businesses and ensuring that the lessons learned from the process are documented and shared.

This case study was based on the photo essay: UNDP photo essay - Stimulating Growth, plus a blog post by GEF Biodiversity Analyst Sarah Wyatt. Text editing for this version by Andrea Egan and Midori Paxton, UNDP with input from Matthew Jordan (Director of Sustainable Development, Gorongosa National Park).
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SDG 6: Clean water and sanitation

Summary for policy makers

Half a million children still die every year as a result of contaminated water and three-quarters of a billion people around the world lack even basic water services. Climate and other environmental changes are disrupting water supplies and reducing water security in many countries.

Protected and conserved areas can help in several ways, by:

- Improving the **quality of water** flowing out of catchments, through judicious protection of forests, grasslands and wetland areas that provide natural filtering services, thus reducing the costs of water purification.
- Increasing the **quantity of water** available in the case of some ecosystems, particularly tropical mountain cloud forests and Andean paramos vegetation, creating water towers that already supply many cities around the world.
- **Storing water** in soils and vegetation to regulate water flow and thus smooth over peaks and troughs in water supply.
- **Sensitive restoration** for instance by removal of exotic species with high transpiration rates.

Careful planning is needed to identify and protect critical water-related ecosystems, forests, grasslands, wetlands and riparian zones, in both protected areas and OECMs. These need to be under management that avoids disturbance so stricter categories of protection are needed here. Other approaches beyond protected areas and OECMs, such as reduced grazing regimes and promoting aquifer recharge, also have important roles to play in improving overall water security and addressing SDG 6.

What is the challenge?

Despite impressive efforts to address global childhood mortality rates, there were still half a million deaths of under-fives due to diarrhoea in 2015.[1] Diarrhoea is caused by a variety of disease organisms including bacteria and amoeba, and is closely linked to inadequacies in water, sanitation and hygiene,[2] particularly in low to middle income countries. In particular, it is caused by drinking water and infant formula contaminated with human or animal waste, from contaminated wells or in *ad hoc* unregulated settlements.[3] Even with decades of effort, 29 per cent of the global population still do not have access to safely managed drinking water services, 785 million people still lack even a basic drinking water service as do a third of primary schools, and three billion people do not have basic handwashing facilities at home.[4]

Many water supplies are also contaminated with a range of other pollutants, particularly agrochemicals (pesticides and fertilisers), heavy metals and industrial waste products. For instance, the use of synthetic nitrogen fertilisers has grown nine-fold since the 1960s and is projected to increase 40-50 per cent more in the next 50 years. Increasing fertiliser use, livestock production and fossil fuel burning have raised nitrate levels above safe thresholds for human and ecosystem health,[5] including in drinking water.[6] Total global leaching and runoff of nitrogen is estimated at 32.6 million tons per year, mostly from agriculture.[7] Phosphate use has tripled,[8] and is also a significant pollutant.[9] Pesticides, herbicides and fungicides enter freshwater systems and have harmful impacts on biodiversity,[10] including at concentrations that current legislation in many countries deem safe,[11] and exposure to pesticides has a variety of impacts on human health.[12]

Furthermore, the planet is facing increasing levels of water stress. 1.7 billion people already live in river basins where water use exceeds natural replenishment.[13] Up to 4 billion people already experience severe water stress for at least one month a year.[14] Agriculture is impacted as well, with 71 per cent of the world's irrigated area experiencing periodic water shortages.[15] A combination of population growth, increased per capita water use (and waste), loss of water retention in wetlands and the disrupting impacts of climate change all contribute to declining water security. In the last century, water consumption increased six-fold, double the rate of population growth,[16] largely due to agricultural use.[17, 18] Water demand will soon exceed reliable supplies at a global scale,[19, 20, 21] with hotspots and critical areas of shortage emerging.[22] Poor planning, and "water grabbing" is leading to tensions within[23] and between[24] countries that share water resources, although the extent to which this risks open conflict is the object of much debate.[25, 26] Over 680 water treaties have been signed since 1820, and the number is increasing,[27] in attempts to defuse international tensions.

SDG 6 attempts to address all of these issues, albeit sometimes obliquely. The overall aims are to "*Ensure availability and sustainable management of water and sanitation for all*", which provides a very wide remit. Target 6.1 aims to "*achieve universal and equitable access to safe and affordable drinking water for all*", Target 6.5 to "*implement integrated water resources management at all levels, including through transboundary cooperation as appropriate*" and Target 6.6 to "*protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes*". This last has a 2020 deadline and may be revised in line with negotiations in the Convention on Biological Diversity. Other targets look at sanitation, pollution control and efficiency, largely beyond our remit here, although indicator 6.3.2 is for a "*proportion of bodies of water with good ambient water quality*".

How can effective area-based conservation help?

There is recognition that meeting SDG 6 will require ecosystem approaches to management and a new emphasis on stewardship.[28] Well-managed natural ecosystems, including those under different

area-based conservation arrangements, almost always produce cleaner water than other ecosystems, in certain specific cases they also produce more water, and importantly many ecosystems help to store water and smooth out flow to improve water security during times of low rainfall.[29]

Improved water quality. Water flowing from natural forest catchments and from many wetlands is cleaner than water flowing through agricultural land, industrial areas or urban settlements.[30] In part, this is simply because there are less pollutants to leach into water in a forest or natural grassland, but is also partly due to the ability of natural systems to neutralise some pollutants, through uptake in plants, natural breakdown systems, etc.[31] The filtering effect is not perfect, the resilient *Giardia* parasitic microorganisms will pass through natural ecosystems into water supplies. But hundreds of municipalities around the world, large and small, have recognised the increased water quality provided by natural ecosystems and draw on these for their water supply, radically reducing the need for artificial treatment.

A third of the world's largest hundred cities draw a substantial proportion of their drinking water from forest protected areas, including Mumbai, Jakarta, Tokyo, New York, Caracas, Abidjan, Cape Town, Sydney and Melbourne.[32] Many of the relevant water authorities are fully aware of the important role played by the protected areas and cooperate actively with managers. In Melbourne, for example, there is a long history of cooperation between water authorities and the managers of national parks supplying water to the city, such as Yarra Ranges National Park and Kinglake National Park.[33] At the same time, there is recognition that in other areas of the water catchment where logging has taken place, water supply is diminished.[34] Other municipalities are unaware of the link between ecosystem integrity and water supply, or take the ecosystem services for granted, or have failed to prevent degradation and loss in the areas and thus have lost some of the water services as well. There is currently a major REDD+ supported forest restoration project in the Chyulu Hills National Park, Kenya,[35] because the hills supply water to the city of Mombasa and forests have been degraded by illegal settlement, charcoal making and cattle grazing.

Increasing water availability. In addition to water quality, certain ecosystems also increase the quantity of water flowing from the catchment. Tropical cloud forests and the Andean *paramos* ecosystem in particular boost net water flow.[36] In the former cases, specially evolved plants high on the mountains or plateaus "scavenge" water from clouds and mist by condensing droplets on leaves, from where they eventually trickle to the ground and enter the water flowing downhill. Tegucigalpa in Honduras received 40 per cent of its drinking water from cloud forest in La Tigra National Park.[37] This is by no means rare; also in Latin America, Quito in Ecuador (from cloud forest in Antisana and Cayambe-Coca protected areas) and Bogotá in Colombia (from *paramos* in Chingaza National Park) gain the majority of their drinking water from natural ecosystems inside protected areas.[38] Many of these ecosystems are in the mountains, where they are exposed to constant mist, cloud and often high precipitation rates, and have become known as "water towers" in consequence. Recognition of the importance of water towers probably came first from Latin America but is now a feature of water planning throughout the world.[39]

Increasing water security: Just as important as net amount of water is its availability throughout the year. Climate change in practice also means climate uncertainty, with increasing fluctuation in precipitation patterns; countries that could previously predict rainfall patterns through the year are now experiencing unexpected droughts or floods. From the perspective of water supply, it is important that water arriving during wet periods is retained long enough to maintain supplies during dry periods, the principle behind reservoirs and other water storage systems. Protected areas and OECMs can help, by retaining water in soils and natural vegetation and regulating water flows; conversely ecosystem degradation often has the effect of decreasing such storage capacity and therefore decreasing overall water security, with the risk of flash floods and water shortages.

Cloud forest
Colombia

Any healthy natural forested or grassland ecosystem will provide the services described above. But protected areas have a key role to play in that they come with a certain amount of long-term security, management systems in place and staff who are aware of and supportive of ecosystem services. Alongside protected areas, OECMs seem to be ideally suited as water towers or water filters, and the recognition of areas particularly for their role in water security is likely to increase over the next few years. Many protected areas have been established to protect watersheds and important wetland ecosystems.

Strategic planning of new area-based conservation initiatives to protect critical natural ecosystems will be important to ensure adequate water supplies for sustainable cities (see SDG 11). Most existing cities have established water supplies; they may be facing pressures due to population growth or climate change, but the basic system is in place. The focus in the future will increasingly be on new cities, or rapidly expanding cities. Africa, for example, is experiencing the highest rate of urbanisation in the world, moving from an overwhelmingly rural society to one in which over a third of its 1.1 billion inhabitants already live in urban areas. This is expected to triple to 1.34 billion by 2050. In 1960, there were only five cities in sub-Saharan Africa with over half a million inhabitants, but by 2015 there were 84, including megacities like Lagos with over 13 million inhabitants. By 2030, there will probably be over 140.[40] Some 17 per cent of city dwellers in sub-Saharan Africa still lack access to treated water, and numbers could increase as councils struggle to keep up with a booming population.[41] China has also created an unprecedented number of cities in the last few years, and water resources are becoming increasingly scarce.[42] Working with these municipalities to identify where and how effective area-based conservation can best support water supplies is an important priority for the future.

Approaches that support SDG 6

Many protected areas and OECMs help to protect water sources and thus support important aspects of SDG 6. Some types of area-based conservation have special roles to play and there are associated conservation tools that can act as support. These are outlined below:

Protected areas

- **IUCN category I-IV and category VI protected areas:** Conserving a pristine water supply implies an ecosystem in good condition and without major disturbance. This means in practice stricter protection than in many protected landscapes (IUCN category V), which often contain farms and settlements. Mount Kenya National Park, Aberdare National Park and Aberdare Forest Reserve near Nairobi provide critical water supplies to the capital city.

OECMs

- **Watershed protection areas:** Existing watershed protection areas outside protected areas may well be suitable sites for OECMs if they protect significant biodiversity, or other ways of formally recognising their role in water services, which in turn means that their emphasis on other values such as biodiversity conservation may increase.
- **Areas of high biodiversity value with reduced grazing regimes managed for conservation:** Identifying such areas in the wider landscape can help to retain vegetation and thus absorb additional water during periods of heavy rainfall, reducing runoff problems but also smoothing out water supply through the year.

Key complementary approaches

These may be applied in protected areas, or OECMs, or in other effective area-based strategies.

- **Systematic conservation planning:** Systematic planning to support conservation will play a critical role in terms of determining where areas of natural ecosystem important for water supply are located and including them within overall land-use planning. Protected watersheds may be quite remote from the recipient population; the Chyulu Hills National Park in Kenya provides water for Mombasa, 250 km away on the coast.
- **Restoration:** Restoration is important in many places where degradation or land use change have already undermined water services; cities like Malaga and New York have already shown that strategic restoration initiatives can be successful in rebuilding important water services (in these cases respectively flood control and drinking water supply).
- **Payment for Ecosystem Services (PES):** Schemes have proved particularly suitable for water services in that they have two of the essential ingredients needed for success: a clearly identifiable buyer (a water company or council) and seller (communities managing an area of natural ecosystem providing water).[43] Quito, the capital of Ecuador, has long benefitted from a PES scheme for water with two protected areas nearby, as has New York.
- **Protected riparian zones:** Setting aside riparian zones along rivers, streams and around lakes can help ameliorate water surges, maintain water quality and retain water within catchments to increase overall water security.

Case study

Maintaining and managing wetlands for fresh water supply and biodiversity

Walthamstow Reservoirs and Wetlands, the UK

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Co-benefit SDGs

Ellie Davey (IEEP) with review by **Mathew Frith** (London Wildlife Trust) and **Kirsty Halford** (Thames Water).

Background: Walthamstow Wetlands, in north London, is the largest urban wetland nature reserve in Europe. The wetland is a partnership project between London Borough of Waltham Forest, Thames Water and London Wildlife Trust, funded by the National Heritage Lottery Fund.

The 221-hectare site hosts ten artificial freshwater reservoirs, which were constructed on the existing marshland adjoining the River Lee, to meet London's growing water demands from the mid-19th century. The Walthamstow Reservoirs form part of the Lee Valley Reservoir Chain, which since passing from public to private ownership in 1989 are now managed by Thames Water Utilities Ltd.[44] The Reservoirs continue to provide potable water to 3.5 million customers in London. In 2017, most of the site was opened to the public as Walthamstow Wetlands.

Walthamstow Reservoirs are a Site of Special Scientific Importance (SSSI) within the UK, and as an internationally important wetland habitat, they became designated as part of

the Lee Valley Special Protection Area and Ramsar site in 2000.

Sustainability challenge: Walthamstow Wetlands requires active management in order to protect the wetland ecosystem and its capacity to purify and maintain water quality.

Thames Water needs to maintain the drinking water quality and supply, and to meet this the reservoirs must be regularly dredged in accordance with a quota. This is important so that the reservoirs do not accumulate excessive sedimentation and maintain an operational reservoir depth.

As a consequence of the above, the reserve underwent a major restoration project in 2014-2017. The dredging produced 9,000 m^3 of excess sediment, which was placed behind 619 metres of reedbed retention structures alongside the reservoirs, creating 1.8 hectares of new reedbed habitat.

Business case: The restoration work of Walthamstow Wetlands has been mutually beneficial for Thames Water and their conservation efforts with regards to water management. The dredging of the reservoirs produced 9,000 m^3 of sediment, which, due to low levels of contaminants, was categorised as non-hazardous waste, which is not suitable for agricultural use. The disposal of this volume of sediment was estimated to cost £1 million in landfill tax, in addition to the carbon cost attached to transporting the material off-site.[45] However, since the sediment was used to establish new reed bed habitats and extend the wetland (confined to the older reservoirs due to their design), Thames Water was spared these costs, and found a sustainable and cost-effective solution to the requirement to dredge the reservoirs. The reservoir where most of the dredging took place is where the backwash from the Water Treatment process comes out.

Key benefits: Securing access to good quality freshwater for Londoners is the key sustainability benefit the Walthamstow Wetlands nature reserve aims to deliver. Healthy wetland ecosystems provide valuable benefits in their capacity to improve water quality. Wetland vegetation and marshland function as natural filtration systems, removing sediment and contaminants such as pollutants and nutrients from water. The removal of sediment in 2017 has ensured that the reservoirs remain operational to provide clean drinking water to 3.5 million Londoners. The creation of these wetland habitats also reduces the frequency of dredging requirements for Thames Water in the future and improves the purification capacity of the wetlands. Furthermore, the extension of the new reed bed habitats performs a key regulatory service in absorbing nutrients, and so increases its filtration capacity further.

The enhancement of the wetlands as a protected area has created an internationally important urban site for biodiversity. The combination of careful reservoir management and habitat restoration means that the site supports 54 rare and vulnerable wetland bird populations, thus fulfilling the aims of the EU Birds Directive. The site qualifies as a Special Protected Area due to the presence of migratory bird species like bittern (*Botaurus stellaris*), northern shoveler (*Anas clypeata*) and gadwall (*A. strepera*). The wetlands also provide breeding and roosting grounds for a range of birds, such as great crested grebe (*Podiceps cristatus*), tufted duck (*Aythya fuligula*), pochard (*A. ferina*), coot (*Fulica atra*) and great cormorant (*Phalacrocorax carbo*), and is one of the UK's major heronries (*Ardea cinerea*).[46]

Furthermore, the creation of additional reedbed habitats provides new areas of shallow water, which has benefitted different species. These buffer zones provide protection and cover for amphibians and water vole populations from predators, and nesting sites for wading bird species. Birds of prey have also been drawn to the site, sightings of sparrowhawk (*Accipter nisus*), kestrel (*Falco tinnunculus*) and osprey (*Pandion haliaetus*) have risen since the completion of the project.[47] Peregrine falcons (F. *peregrinus*) now breed on site, one of less than 15 sites in London.

Since being open to public access in 2017, the wetlands have received over 550,000 visitors, providing benefits to human health, wellbeing and recreation.[48] Access to blue and green spaces supports active lifestyles, good mental wellbeing, cleaner air quality and improved

social cohesion. There are woodland pathways, bike trails, a refurbished bird hide, an education centre and historic industrial buildings on site. London Wildlife Trust delivers community engagement activities, volunteering opportunities, educational workshops and ecological surveying to involve members of the local community in the conservation efforts onsite.[49] The site is also home to a successful and well-established recreational fishery, the largest in London. The fisheries are run by Thames Water and provide both coarse and fly fisheries. Fish species such as carp (*Cyprinus carpio*), bream (*Abramis brama*), trout and pike (*Esox lucius*) thrive here, attracting anglers from across the country.[50]

Conservation solution: Since the major enhancement project opening in 2017, the Walthamstow Wetlands' ability to provide fresh water seems to be on a sustainable footing. Main ongoing issues with the reserve are linked to managing the use of the site as a recreation area vis-à-vis the conservation of biodiversity, in other words mitigating delivering benefits to SDG 11 and SDG 15.

There were concerns that public access and increased footfall on site would be harmful to the fragile wetland ecosystem and biodiversity. For example, the refurbishment of the bird hide will likely increase the footfall of people in this location close to the bird habitats, and this will need to be managed with regard to bird sensitivities. Therefore, precautionary measures based on the advice of environmental authorities were integrated into the design to mitigate disturbance to rare and vulnerable bird species with the seasonal closure of pathways to divert the public away from breeding and refuge areas. The vulnerability and importance of this balance is communicated to the public through liaison with on-site rangers, sessions at an interactive educational centre, and various walks and talks.

To ensure that these measures are effective, London Wildlife Trust has completed several annual Bird Monitoring reports, documenting changes in bird population and distribution across the site.[51]

The site will also be assessed and reviewed on a 5-yearly basis by SPA (Special Protected Area) Review, which will monitor populations of bird species to assess the success of the conservation efforts.

Lessons learned: The synergy of benefits delivered across SDGs 6, 11 and 15 demonstrates how wetland conservation and restoration efforts in Walthamstow are effective solutions to deliver benefits for multiple SDGs.

Securing regional water supply through protected areas restoration

Network of nature reserves surrounding greater Cape Town, South Africa

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Co-benefit SDGs

Louise Stafford, Daniel Shemie, Timm Kroeger, Tracy Baker and **Colin Apse** (The Nature Conservancy), with support from **Jane Turpie** and **Katherine Forsythe** (Anchor Environmental Services).

"*An investment of R372 million (US$25.5 million) in ecosystem restoration will generate annual water gains of 55 billion liters (55 million m³) a year within five years compared to business-as-usual — equivalent to one-sixth of the city's current supply needs — increasing to 100 billion liters a year (100 million m³) within 30 years. Water gains are achieved at one-tenth the unit cost of alternative supply options.*"[52]

Background: The mountainous water catchments of the Western Cape province are often called "water factories", as they provide 57 per cent of the water resources for South Africa. The Western Cape Water Supply System supplying water to Greater Cape Town, consisting of dams and aquifers connected through a network of pipelines, originates in these water factories.

The continued provision of water from the Western Cape's catchments relies on maintaining a healthy network of protected areas that cover over 90 per cent of the province's catchment areas.

These protected areas were originally designated for their critical biodiversity values as representative of the Cape Floral region, a biodiversity hotspot with over 9,600 plant species, 70 per cent of which are found nowhere else in the world.

Many of the protected areas, including Hottentots-Holland, Limietberg and Jonkershoek Nature Reserves, that are critical to the Greater Cape town region's water supply, are threatened by alien invasive species that harm the native fynbos vegetation, cause increased fire intensity that destroys the native seed bank, and consume significantly more water than the native vegetation each year.

Sustainability challenge: Water security is a major concern for the City of Cape Town, which faced the possibility of running out of water following a three-year drought between 2015 and 2018. The day the taps run dry, dubbed "Day Zero", was narrowly avoided but the threat remains. Cape Town's population is growing fast, at a rate of about 2.6 per cent a year, while climate models show decreased rainfall accompanied with increased temperatures in the future, increasing the risk of water shortages.

Case study

Cape Town's water demand is predicted to outstrip current supply by 2021. Current forecasts suggest that an additional 300-350 million litres (0.3-0.35 million m^3) of water a day will be needed by 2028 to ensure supply meets demand. Over R8 billion (US$540 million) in public funding is being considered to increase the water supply through investments in deep aquifer drilling, seawater desalination, water reuse and increased surface water storage to meet the required demand.

Conservation solution: Improving the ecological condition of the source water protected areas is a cost-effective and critical step to address regional water needs.

Over two-thirds of the sub-catchments supplying the Western Cape Water Supply System (WCWSS) are affected by alien plant invasions, reducing the amount of water that reaches the rivers and dams that feed the region. Invasive woody plant species, such as pine, Australian acacia, and eucalyptus, that have come to dominate in these source catchments, have higher evapotranspiration rates and use up to 20 per cent more water than the region's native fynbos vegetation. This leads to attendant decreases in surface water runoff as well as a reduction in infiltration or deep percolation to aquifers. Because woody invasive trees have deeper rooting systems than herbaceous land cover, they are also able to access and extract more groundwater even in times of low rainfall, allowing their growth cycles to persist.

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In response to the increasing threats, a broad coalition of partners from conservation and government to business communities[1] came together under the auspices of the Greater Cape Town Water Fund Steering Committee, with an aim to identify solutions and work together to improve water security. The Committee commissioned studies to evaluate the impact of nature-based solutions on water supply (see below), beginning with targeted removals of alien plant invasions, and to determine whether investing at scale in catchment restoration would be cost competitive with other supply-side solutions. As a result, the Greater Cape Town Water Fund will be the catalyst for the funding and implementation of catchment restoration that will help secure the future of Greater Cape Town's water supply, with protected areas as one of the key focus areas.

Business case: One of the supporting analyses modelled a 30-year period, discounting both costs and water gains at 6 per cent for surface water sub-catchments. Seven of the twenty-four sub-catchments in the Western Cape area, comprising a total of 54,300 hectares, were identified as priorities for restoration. Results show that investing R372 million in the restoration of these areas (US$25.5 million; discounted present value) will generate expected annual water gains of 100 billion litres (100 million m^3) within thirty years compared to the business as usual scenario. Importantly, invasive alien plant removal alone would yield up to an additional 55 billion litres (55 million m^3) within six years. Approximately 350 job opportunities will be created in the first six years of implementation, as removing alien plant invasions is very labour intensive.

Catchment restoration, including the restoration of protected areas, was estimated to be significantly more cost-effective than other water augmentation solutions for the greater Cape Town Area, supplying water

[1] The Nature Conservancy, National Department of Water and Sanitation, National Department of Environmental Affairs (Environmental Programmes), Provincial Department of Environmental Affairs and Development Planning, City of Cape Town, SANBI, CapeNature, Coca-Cola Peninsula Beverages, Nedbank, Remgro Ltd and WWF.

at more than one-tenth the unit cost of alternative options.

Restoration of the water catchment and its protected areas was estimated to produce greater water yields than all other supply options except desalination, which is far more costly. The results of catchment restoration programmes are also expected to be realised quickly, with improved supply showing as soon as the first winter rains. Furthermore, catchment restoration produces water yield gains into perpetuity if areas cleared of invasive alien plants are maintained.

In addition to restoration focused on the removal of invasive plant species, additional benefits to water security could also be gained through wetland restoration. Four wetlands in the WCWSS — Upper Riviersonderend, Du Toits, Olifants and Zuurvlak — have been identified as of strategic importance for Greater Cape Town water supply by applying a set of criteria considering their position in the catchments and their hydrological and geomorphological characteristics. A preliminary analysis of the water storage and nutrient removal services provided by these four wetlands, based on avoided replacement costs for water storage and treatment costs with a 30-year time horizon and 6 per cent discount rate, estimated that wetland rehabilitation would generate values of R280,000-R560,000 per year in water storage provided by all four wetlands and R472,000-R937,000 per year in nutrient removal by the Zuurvlak wetland, for a combined net economic benefit estimated at R0.81-R1.35 million/year.

Lessons learned: Protected areas form the backbone of water security for the Greater Cape Town water supply. Restoring the native vegetation and ecological function across these protected areas is a cost effective solution for improving water availability in the region. Clearing invasive plants – the main activity of the water fund – not only reduces a major threat to the biodiversity of the Cape Floral region, but also restores the full capacities of the "water factories" of WCWSS.

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Next steps: The near-term priorities for improving the water security conserving biodiversity and for the Greater Cape Town Water Fund will be focused on strategic removal of invasive alien plants and the maintenance of restored native vegetation. Over time, the Water Fund plans to deploy a wider range of ecological interventions in WCWSS source water areas. These proposed interventions include riparian restoration, the restoration and protection of wetlands, and agricultural land use improvements. Implementation of a broader set of ecological infrastructure interventions will continue the collaborative science-based approach.

The Water Fund will use its strategic plan to guide implementation and associated monitoring and evaluation, in partnership with the landowners and land managers of the priority sub-catchments. Putting the strategic plan in place will include building the institutional capacity of the Greater Cape Town Water Fund to lead or support restoration efforts and creating a sustainable funding mechanism to help maintain the catchments.

Case study

Supplying clean drinking water to a capital city

Chingaza Reserve above Bogotá, Colombia

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Co-benefit SDGs

Nigel Dudley (Equilibrium Research and IUCN WCPA)

Background: Bogotá is the capital of Colombia, a country with a rapidly growing economy, having just emerged from decades of virtual civil war, with serious security issues remaining. Colombia has a wide range of ecosystems, including Andean mountains, dense rainforest in the Amazon, grassland and savannah within the Llanos, extensive coastal coral reefs and mangrove and offshore ecosystems. There are also large cultural landscapes, such as the coffee-growing region, recognised as a cultural World Heritage site. This variety has resulted in Colombia having some of the highest levels of biodiversity on the planet; however, much of this is under pressure from development and climate change.[53] The páramo ecosystem, a high biodiversity ecosystem endemic to the northern Andes and unusual for being found at a relatively high altitude, is of particular significance here.[54] There is also an extensive and still expanding system of protected areas. While many are managed by the central government, others are under the governance of local authorities, communities and Indigenous people.[55]

Sustainability challenge: Bogotá's rapid growth has thrown many municipal systems under strain, including the provision of clean drinking water. In 1950, the population of Bogotá was 630,315; in 2020 it is estimated at 10,978,360, an increase of over 10 million in 70 years. This trend has been accelerating; the population has increased by over a million since 2015.[56] Some 34 per cent of the Colombian population live below the poverty line,[57] and although inequality has decreased slightly, it remains stubbornly high.[58] Provision of clean water is therefore a priority; many people will be unable to buy bottled water or even have the wherewithal to boil water before drinking. At the same time, some ecosystems are under particular pressure, including the páramo, which is being converted to agriculture such as potato production, cattle ranching and for coal mining.[59] Justifying conservation in a country where many people are still poor is tricky, but much easier if conservation actions can be shown to provide direct benefits to people.

Conservation solutions: Many natural ecosystems provide pure water; some also increase net water flow. Chingaza National Park, almost on the borders of Bogotá, covers 766 km² and varies in altitude from 800 to over 4,000 metres. It contains around 40 glacial lakes and is almost entirely within the Orinoco watershed. Chingaza contains important species like tapir (*Tapirus terrestris*) and bear (*Tremarctos ornatus*). It also supports a unique flora, including bog mosses that absorb huge amounts of

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water and frailejones (*Espeletia* spp.), which have tall spikes with succulent, hairy leaves in a dense spiral pattern, which condense water droplets from the clouds and mists that habitually cloak the region. Frailejones also have low levels of transpiration of water, which increases water seeping down into the ground from the plant.[60] This combination of factors means that the native vegetation increases net water flow downstream. Lack of pollution and the existence of natural filtration processes in the ecosystem also produce very pure water, thus radically reducing the need for expensive downstream purification processes. Chuza Reservoir, with a capacity of 257 million m^3, is located inside Chingaza Park in the basin of a tributary of the River Chuza Guatiquía. This reservoir is the core element in the Bogotá Water Company's Chingaza System.[61] Chingaza contributes 80 per cent of the city's high-quality drinking water.

Sustainability measures in place: Steps have been taken to try to ensure that the source of water supply is well protected and adequately funded. The Agua Somos Water Fund has been in place since 2008 to help provide financial support for the protected area. The Fund has convened important stakeholders and has had some success in increasing awareness about water security issues, including conservation of Chingaza National Park.[62] But there is still a general lack of understanding about the role of natural ecosystems in supplying water, some donors have dropped out of the scheme. Younger people tend to understand the benefits more fully and be more willing to pay for their maintenance.[63] However, páramo continues to be destroyed both inside and outside the national park. Furthermore, climate change may well mean that there is less cloud cover in the region, which will reduce the net amount of water released from the watershed; there have already been some atypical droughts.

Business case: Bogotá gets plentiful supplies of pure water from the national park, with no other obvious sources available; serious losses from Chingaza would undermine the whole water system of the capital. A bottling plant at the edge of the park uses this water directly.

Lessons learned: There is general recognition of the importance of Chingaza as a source of water by those most closely involved, including Parques Nacionales Naturales the state protected area agency, the regional water company, and key local and international businesses. However, this understanding has not yet spread to the local

population, despite attempts at education and capacity building. In consequence, the protected area is itself not immune to continued degradation and struggles to raise funds for management.

Next steps: Further action is needed to ensure that citizens of Bogotá understand the source and fragility of their water supply, and to persuade water users that it makes financial and business sense to increase support to ensure that the water supply is not compromised or reduced.

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SDG 13: Climate Action

13 CLIMATE ACTION

Summary for policy makers

Effective area-based conservation can contribute to the climate strategy outlined in SDG 13 by reducing net emissions, helping reduce the impacts of a wide range of weather-related hazards and integrating climate change strategies into more general approaches to land and water management.

There are four main roles for area-based conservation in contributing to climate action:

- Disaster risk reduction (DRR) through buffering floods and providing storage space for flood water; stabilising soils against dust storms and desertification; protecting coastlines against storms; and blocking landslides and avalanches on steep slopes
- Providing other ecosystem services: to help humanity deal with climate-related changes, described throughout this report
- Storing and sequestering carbon: in forests, grasslands, peatlands, ocean ecosystems, and in managed ecosystems within protected landscapes
- Demonstrating impacts of climate change: for instance, through monitoring rate of glacier retreat

Well-located protected areas are key tools here, complemented by other tools such as carbon storage schemes (e.g. REDD+), Payment for Ecosystem Services schemes, and restoration opportunities, focused on likely future conditions.

What is the challenge?

Greenhouse gas emissions are more than 50 per cent higher than they were in 1990.[1] The impacts are evident throughout the world.[2] All the signals are that the rate and severity of climate change are both at the more severe end of past projections, and that climate change is also accelerating.[3]

Greenland lost 260 billion tonnes of ice per year, and Antarctica lost 115 billion tonnes per year from 1993-2006.[4] Arctic sea ice is also markedly declining.[5] Loss of spring snow cover and ski slopes in the northern hemisphere[6] brings the issue home to many national economies.[7] There are dramatic changes to the world's oceans. The top 700 metres of ocean show a warming of 0.4° Fahrenheit since 1969.[8] Resulting changes in the distribution and life cycles of marine species seem to be even greater than on land.[9] Global sea level rose about 20 centimetres in the last century, with the rate almost doubling in the last two decades and accelerating slightly every year,[10] leaving an estimated 570 global cities at risk of a 0.5 metre sea-level rise by 2050.[11] And ocean acidity has increased by 30 per cent since the start of the Industrial Revolution, which has profound implications for marine life.[12]

Life on land will also be changed in ways that are still hard to predict. Warming temperatures and an increase in climatic extremes are already impacting human livelihoods[13] as well as whole ecosystems and myriad species.[14] Climate change is a recognised factor in threats to food security,[15] water security[16] and human health.[17] The economic implications are profound for virtually every sector of the economy.

Additionally, the incidence and impacts of natural hazards continue to increase,[18] and are influenced by climate change.[19] Typhoons, hurricanes, floods, droughts, sand storms, landslides and the impacts of tidal waves are being exacerbated by a combination of increasing climatic uncertainty and extremes of weather,[20] rising sea levels and the removal or degradation of many of the natural ecosystems that have traditionally helped to buffer extreme weather events. Perhaps most dramatically of all, fire is increasing, in terms of both frequency and severity; the conflagrations that swept across huge areas of Australia in early 2020 were markedly different and more severe than anything seen before.[21] Increased fire is also being seen in the far north, in Canada[22] and Russia.[23]

While the majority of the world's population now accepts the reality of climate change and of our own role in this phenomenon,[24] targets to reduce the impacts of climate change, in particular the agreement reached in Paris at the Conference of Parties of the UN Framework Convention on Climate Change, are not being met; in many countries, emissions have still been increasing.[25]

There has also long been reluctance amongst some conservation groups to look at "solutions" to climate change other than a radical reduction in emissions. There is also a fear that the role of carbon storage and sequestration in ecosystems in contributing to climate mitigation strategies is being over-stated or could lead to perverse results.[26] When talking about the role of protected areas, these concerns focus on the risk that governments will report existing protected area coverage as progress towards addressing climate change and use this to disguise inaction elsewhere. Challenges in addressing climate change are therefore not only related to what actions to take, but also about how these might be perceived, used and misused.

SDG 13 has the overall aim to "*take urgent action to combat climate change and its impacts*".[27] Specific targets focus first on helping to strengthen resilience against climate-related disasters (13.1) and integrating climate change measures into national policies and planning (13.2). The indicator for this sub-target includes to "*adapt to the adverse impacts of climate change, and foster climate resilience and low greenhouse gas emissions development in a manner that does not threaten food production…*". In particular, "*low greenhouse gas emissions*" is a net target and includes reducing emissions from ecosystems and sequestering additional carbon. Other issues include building capacity and education around climate change and its impacts

(13.3), and linked aims to UNFCCC goals of US$100 billion a year to fight climate change (13.A) and raise capacity in Least Developed Countries and Small Island States (13.B). While mobilising the level of funding discussed falls outside natural resource management, all other elements have direct links to area-based conservation.

How can effective area-based conservation help?

There is a growing interest in the potential of nature-based solutions to climate change, and the role of protected areas within this approach. Protected areas and OECMs can provide a suite of responses to climate change, in terms of both mitigation and adaptation,[28,29] including: (i) use of natural ecosystems to prevent extreme weather events from developing into human disasters, through **disaster risk reduction** or *eco-DRR*;[30] (ii) by helping society adapt to rapidly changing environmental conditions through judicious use of **ecosystem services**; (iii) by fostering climate resilience by maintaining as far as possible intact, naturally resilient ecosystems; (iv) by mitigation of climate change through **carbon sequestration** and storage; and (v) as a key tool in **demonstrating the impacts of climate change** to politicians, companies and civil society.

Disaster risk reduction: Healthy natural ecosystems have proven roles in reducing the impacts of a wide range of weather-related hazards,[31] although like many other ecosystem services these are often only recognised once they have been degraded or destroyed. Natural flood plains and vegetation on steep slopes and riversides all help to absorb flood water or slow down the rate of flow.[32] Similarly, coastal mangroves[33] and other woodlands, sand banks, coral reefs and coastal marshes[34] help to mitigate the impacts of storm surges. Dryland vegetation stabilises soils,[35] reducing the chances of both dust storms[36] (and subsequent respiratory problems) and soil loss and desertification. Forested slopes help to prevent avalanches,[37] and rock and mud slides after extreme weather events, and incidentally play a similar role after earthquakes in mountainous areas.[38] In many situations fire is more likely to spread through degraded forests than healthy natural forests. Many protected areas already perform these functions,[39] and are managed with these values in mind;[40] one hope of a focus on SDG 13 is that these values will be more generally recognised. But additionally, many other areas are set aside, or are being set aside, for their role in coastal protection, flood prevention, halting desertification and similar. Some of these may in time become protected areas, but others are candidate OECMs, with the hope that if this takes place conservation values will receive higher attention than they have hitherto. Acceptance of the role of natural ecosystems in DRR has not come easily, despite the evidence, and there is considerable momentum (and money) behind maintaining the status quo, which has been to rely on "hard" engineering solutions. But these processes are generally changing.

Maintaining the supply of other ecosystem services: Climate change is the great disruptor, so that many, many other functions will be thrown under greater pressure than before. Many of the other services described in this report will become increasingly important under conditions of climate change: particularly food security (SDG 2), water security (SDG 6) and the underlying attempts to maintain healthy, functioning and dynamic ecosystems and other aspects of biodiversity (SDGs 14 and 15).

Climate resilience: The concept of ecosystem resilience is defined as the ability of a system to undergo, absorb and respond to change and disturbance while maintaining its functions.[41] There is a growing conviction amongst conservation biologists that greater biodiversity also confers greater resilience within ecosystems[42] and recognition that ecosystems with high carbon frequently also have high biodiversity.[43] This is a fast-moving and somewhat contentious field, but there is a general acceptance now that more intact ecosystems are better able to withstand perturbation than degraded, damaged or seriously fragmented ecosystems.[44] These values have been explicitly recognised by the Intergovernmental Panel on Climate Change for over a decade: "while *regrowth of trees*

due to effective protection will lead to carbon sequestration, adaptive management of protected areas also leads to conservation of biodiversity and reduced vulnerability to climate change".[45] Yet many remaining intact ecosystems are being destroyed,[46] creating an urgent need for creation of protected areas to maintain resilience in these fragile places.[47] This also highlights the importance of maintaining intact ecosystems outside the global protected area systems, through OECMs and other area-based approaches. Managing biodiversity and ecosystem services for climate change requires a dynamic approach, taking into account likely future scenarios and incorporating flexibility.[48] Planning at landscape/seascape/water catchment scale is needed, where protected areas and OECMs form a mosaic, linked if necessary by corridors along climate gradients and connecting refugia that enable species to move in response to climate change.

Carbon sequestration and storage: It has taken a long time, but recognition of the importance of, and risks to, carbon stored in vegetation and soils is now centre stage in climate discussions and recognised as a key role for natural ecosystems. Associated financial support packages, such as REDD+, whilst still insufficient are nonetheless helping many communities to maintain ecosystems rather than convert them to other uses. Evidence has been building gradually over time. First, that forests stored significant amounts of carbon, and that they continued to do so in old-growth phases in the tropics[49, 50] and boreal[51] forests, making primary forests of particular importance,[52] while forest regrowth in the temperate region after historical losses is also providing important sequestration benefits.[53] Estimates suggest that in half the tropical forest countries, half national emissions could be balanced by effective protection, sustainable management and restoration of forests.[54] Then the focus increasingly shifted to peat, and the vast stores in the tropics[55] and in the boreal, where research now suggests that northern peatlands store over 1,000 Gt of carbon, double previous estimates.[56] More recent is the recognition of the extreme importance of blue carbon in marine ecosystems[57] such as mangroves,[58] seagrass, kelp and in the vast plankton populations. The concept of "blue natural capital" has been gaining increasing attention.[59] More recently still, the carbon storage[60] (and potential storage through restoration)[61] of grasslands and savannahs has been receiving increasing attention.[62]

The significance – and the value including economic value – of maintaining carbon rich natural ecosystems is increasingly realised.[63] This includes the world's protected area system, which has long been recognised as a significant carbon store,[64] but also increasingly land and water outside protected areas. Many REDD+[1] projects, for instance, are deliberately targeting currently unprotected ecosystems and providing incentives to maintain these; many are likely eventually to be recognised as OECMs or connectivity corridors. Many REDD+ projects aspire to deliver against multiple SDG goals,[65] although with mixed success.[66] There are increasing calls for massive tree planting to counter climate change impacts,[67] through initiatives such as the Bonn Challenge,[68] which could open up huge new areas of potential OECMs. But there are also cautionary voices questioning the extent to which such approaches can really address climate change,[69] and fears that enthusiasm for tree planting could have the perverse result of destroying old-growth and ecologically valuable grassland and savannah.[70]

Demonstrating climate change impacts: Protected areas can play a key role in monitoring and providing real-life examples of climate change in action; things that people can see in front of them and experience first-hand are more compelling than articles, books or films. For example, most of the world's glaciers are now retreating,[71] and some have already disappeared,[72] causing damage to specialist species.[73] A growing number of protected areas that contain glaciers are marking out their retreat.

[1] REDD+ stands for (in brief) "Reduced emissions from deforestation, forest degradation and other activities" and represents a mechanism under the UN Framework Convention on Climate Change to provide positive incentives to support developing countries improve forest protection and management.

Kenai Fjords National Park, Alaska, where displays show the reality of glacier retreat: The left-hand picture is the 1980s' viewing platform for the glacier, now surrounded by forest; the next two show the glacier front line in 2005 and 2010. Pictures taken in 2017.

Table 13.1: Protected and conserved areas providing Disaster Risk Reduction

Hazard	Hazard prevention	Role of protected areas
Floods[83]	Temporary storage in natural wetlands Regulation of water flow	Protecting natural floodplains Maintaining or restoring natural flow patterns Protecting wetlands and marshes to act for spillover and ponding
	Buffering effect of vegetation by waterways and on steep slopes	Protecting riparian and mountain vegetation Restoring degraded forests and moorland
	Preventing settlement in flood-prone areas	Zoning restrictions in protected landscapes, etc.
Droughts, desertification, dust storms	Maintaining natural vegetation and drought resistant plants to slow erosion, prevent desertification, maintain grazing options	Protection of natural vegetation Restoration where necessary Agreement on sustainable use within protected landscapes
	Emergency sources of wild food and animal fodder during periods of drought	Protecting natural forests in drought-prone areas Restoration where needed Sustainable use in protected landscapes
Typhoons and hurricanes	Physical protection against storms and ocean surge	Protection of coral reefs, sand dunes, barrier islands, mangroves, coastal marshes and coastal and inland forests
Sea-level rise	Physical protection	Protection, active management and where necessary relocation of coastal ecosystems
Avalanche and landslides	Using forest cover to reduce likelihood and impacts of snow avalanches and shallow landslides	Protect and where needed restore forests on slopes in high risk areas
Wildfire	Buffering against fire through retention of intact forest	Maintaining intact forest, particularly in areas where fire is not naturally prevalent
	Managing risk in fire-prone areas	Prescribed burning, fire prevention training, enforcement of fire regulations, communication programmes about fire risk

Approaches to support SDG 13

Protected areas

- Estimates show that protected areas already account for about one-fifth of all the carbon sequestered by terrestrial ecosystems each year.[74] Forests,[75] peatlands,[76] grasslands[77] and ocean sinks[78] are all important. Given the growing role of REDD+ schemes in forests, and interest in carbon storage in other ecosystems, the area of land set aside for carbon storage is likely to increase markedly in the future. As regards DRR, virtually any protected area or OECM can play a supportive role in disaster reduction, and in addressing the slower and more insidious changes that will affect human society as a result of climate change; many of the latter issues appear under other SDGs. Table 8.1 outlines some of the main ways in which this can be important and then we outline two important approaches that can help planning and support for such services.[79]

OECMs

- Many OECMs will also play roles in both carbon storage and sequestration and in DRR; indeed, both these recognised uses of lands and waters are likely to provide additional opportunities for conservation beyond designated protected areas

Key complementary approaches

These may be applied in protected areas, or OECMs, or in other effective area-based strategies:

- **Payment for Ecosystem Services schemes (PES)**: PES including REDD+ and other voluntary carbon storage schemes are ways to retain valuable natural ecosystems both inside and outside of officially protected areas. The main challenges are to identify and cost the likely benefits and find specific groups of people able and willing to pay for and sell these services. National governments still often play this role, although sub-national and municipal government can also have a role to play. There is also an important role for private sector users of ecosystem services.
- **Restoration**: Restoration is critical in many areas, and can create important carbon gains, but only if carefully planned and managed to avoid perverse results. Likely future climatic conditions need to be taken into account in planning restoration.[80] Fast-growing tree plantations offer little in terms of benefits if the resulting pulpwood is used in short-life products or biofuels[81] where carbon quickly enters the atmosphere again. Ploughing or even worse felling native forests to plant trees can release more carbon than will be regained in a realistic timescale. Restoration to improve net carbon balance is still an emerging set of methodologies that require further work to refine.
- **Areas identified as climate refugia**: These can be important in determining where conservation is most urgently needed to maintain reference populations.[82]

Climate adaptation through the protection of cultural landscape and practices

The Shouf Biosphere Reserve, Lebanon

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13 CLIMATE ACTION

Co-benefit SDGs

5 GENDER EQUALITY

6 CLEAN WATER AND SANITATION

10 REDUCED INEQUALITIES

11 SUSTAINABLE CITIES AND COMMUNITIES

15 LIFE ON LAND

Lina Sarkis and Al-Shouf Cedar Society Team.

SHOUF BIOSPHERE RESERVE
محمية الشوف المحيط الحيوي

"*A biosphere reserve where protection of human health, wealth, and the environment are overarching goals – where boundaries are delineated, land-use regulations enforced, climate change mitigated, ecosystem services maximized, biodiversity conserved and natural resources protected.*"
– the vision of Shouf Biosphere Reserve –

Background: The Shouf Biosphere Reserve (SBR), Lebanon, declared in 2005, is one of the largest mountain protected areas in the Middle East. It includes the Shouf Cedar Nature Reserve (established in 1996) and is located in the Shouf mountains of central Lebanon, the Ammiq Wetland, east of the Shouf in the Beqaa Valley, a Ramsar site and one of the last remaining wetlands in the Middle East, in addition to twenty-two villages surrounding the Nature Reserve from the eastern and western sides of the Barouk and Niha mountains. It has an area of approximately 50,000 hectares, equivalent to 5 per cent of the total area of Lebanon and extends along an altitudinal gradient ranging from about 1,100 to 1,900 metres in the Shouf district and the West Bekaa.

SBR has adopted a landscape approach in its work, which consists of understanding the functions, studying societal demands, designing landscape options and finally supporting implementation through capacity building and creating sustainable models.

Sustainability challenge: The cultural landscape of the Shouf and its associated traditional practices are impacted by various threats: (i) Forest loss, degradation and fragmentation due to intense logging, wood and fodder collection, and uncontrolled grazing; (ii) Overgrazing caused by the decline of traditional transhumance systems, and by land tenure changes; (iii) Uncontrolled harvesting of non-wood forest and pasture products, threatening the natural populations of some species; (iv) Environmental threats, which are exacerbated by climate change: land degradation caused by rural abandonment, forest fires caused by the burning of agriculture waste and the accumulation of dry biomass on abandoned land, urban sprawl caused by unregulated spatial planning; (v) Lack of economic incentives

to reverse rural abandonment and unemployment, which mostly impact women and youth. Climate change poses additional threats to this fragile ecosystem. The famous cedar trees (*Cedrus libani*) **could be pushed to higher elevation refugia**[84] and are also threatened by invasive sawfly pests, necessitating an active conservation programme.[85]

The Shouf Biosphere Reserve remains a pivot site in agriculture and diversification of species. This diversity is essential for human survival; therefore, concrete measures and strategies must be taken to ensure conservation and to face the growing pressures of climate change.

The Shouf Biosphere Reserve unremittingly strives to remain a learning site for sustainable development, restoring the ecological functionality of the landscape, building the capacities and enhancing the welfare of the surrounding communities. These actions are all seen as a key in ensuring adaptation to climate change for the local communities and the underpinning ecosystem alike.

Fundamentally, SBR is trying to address the negative impact of agricultural and other types of practices on ecosystem stability and biodiversity. Modernisation and the introduction of "perverse" practices that aimed at increasing production and consequently profit without any concern for human health nor for the environment started in the late 1960s and were exacerbated during the Lebanese civil war that led to rural migration and land abandonment. These practices have shown their limitations, and the solution will happen through the re-introduction and/or consolidation of cultural and traditional practices that are known to have a positive impact.

Key benefits to sustainability: The Shouf region is one of Lebanon's great centres of biodiversity. The SBR is home to 32 species of wildlife, 275 species of birds, 31 species of reptiles and amphibians and 1,054 species of plants. The site also provides essential resources and ecosystem services that are linked to human health, support the maintenance of good water supply, produce bioenergy and also support economic activities, namely agriculture and ecotourism. The reserve also delivers the basic services for production, consumption and habitation.

An economic valuation study was conducted to determine the economic benefits generated by SBR. Most of its benefits derive from water related ecosystem services including maintenance of water quality, for both the water grid and as source for bottled water. Benefits linked to carbon sequestration by SBR vegetation are estimated to be significant. The reserve is also an important local source for biomass briquettes and compost. The reserve has enhanced ecotourism and it supports local employment equivalent to circa 100 jobs, in addition to the increasing number of visitors (118,000 to the reserve in 2019).

The sustainable management of the cultural practices as implemented by SBR helps maintain healthy and biologically diverse agro-silvo-pastoral systems where transhumance grazing has a strong effect on species and community diversity, and vegetation dynamics creating openings and corridors in forest and rangelands resulting in the emergence of a mosaic-like, diversified landscape that displays greater stability. For example, the traditional harvesting of non-timber products from forests and pastures has led to a more or less intense domestication of plant species resulting in higher levels of genetic diversity that display greater resilience; traditional cultivation in terraces allowed the selection of a highly diversified number of local crop varieties while their dry stonewalls played an important role in terms of biodiversity conservation, as micro-habitats for rocky plants, insects, reptiles, amphibians, birds and mammals.

Well preserved cultural practices also play an instrumental role in environmental risk reduction. Stonewall terrace systems help create a warmer micro-climate, facilitate soil water infiltration and storage, and act as firebreaks reducing the risk of fire spread, and providing access and water for firefighting. A mosaic-like landscape with forest, scrub and pasture stands, and opening and

corridors created by transhumant grazing systems, create natural firebreak areas, regulate water runoff, are home to beneficial insects that increase biological control of crop insect pests, and provide pollination services.

Conservation solution: To support adaptation to climate change,[86] SBR has vastly increased its efforts over the past few years. It has begun to take actions that will lead to greater prosperity and better livelihood while building climate resilience.

Forest restoration is a critical action taken by the SBR to respond to national commitments on biodiversity conservation and climate change. Maintaining and restoring Mediterranean mosaic-like landscapes with a high diversity of land uses, habitat types, and wild and cultivated species and varieties, is also critical to increase resilience against climate change.[87]

Multi-cropping is an important practice maintained by the reserve; and higher diversity of species is more resilient against climate variability and change because each species can cope differently with temperature and humidity conditions, and thus environmental change can be handled easier. For instance, planting different species and varieties of the same species at the farmland and landscape levels reduces the risk of losing the entire crop if an exceptional climatic event occurs and increases opportunities for economic diversification.

Enhancing the green economy in the SBR landscape is another action taken by the SBR through the promotion of small local businesses that respond to climate change, and value chain development around goods and services from the landscape ecosystems, because agriculture is not only a fundamental human activity at risk from climate change, it is a major driver of environmental and climate change itself. It has the largest human impact on land and water resources.

More specifically, through its programmes, the reserve continuously adapts comprehensive measures aiming at recovering the landscape after the disturbances that have affected it due to climate change. In view of climate change mitigation and adaptation, the reserve is currently active in implementing a range of measures, including for example:

- Management of biomass quantity and composting through thinning activities and the production of eco-briquettes and compost with the multiple objectives of reducing climate-related risks (e.g. forest fires) while creating economic opportunities (e.g. briquettes production for house heating).
- Conserving and sustainably managing high mountain forests by monitoring biodiversity to determine the impact of cultural practices on biodiversity.
- Promoting ecotourism (trails, guest houses, tables d'hôtes, creation of a botanical trail, etc.).
- Restoring stonewall terraces and abandoned lands, plantation of 70,000 seedlings in 2019 to increase forest areas and planting native species of high economic value.
- Preserving water sources (treatment, establishment of gabions…), and effective forest planting techniques to improve soil water harvesting and storage in the planting sites to help compensate for the growing trend of water deficit during summer and increase the survival rate of seedlings.
- Encouraging business actors in the trade chain to support and promote traditional, biodiversity-friendly land-use practices.
- Raising awareness of the importance and benefit of conservation and climate change mitigation and adaptation through capacity building campaigns.
- Designing and setting up monitoring systems and tools to periodically assess the evolution of the ecological and cultural values of the agro-silvo-pastoral systems and traditional practices, the natural habitats and key species populations. This will lead to improved scientific knowledge and ability to monitor the state of biodiversity and eco-cultural indicators of the landscape. These systems will include a form of citizen science, involving the local communities in the process.

Lessons learned: The rationale of the activities within the reserve builds on the awareness that the agro-silvo-pastoral landscape of the Shouf is the product of

Case study

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centuries of interaction between nature and people, which nowadays is threatened by climatic, economic and social changes. The conservation of this unique Mediterranean landscape and its inhabitants will only be possible if its resilience to such changes is strengthened through an integrated programme that tackles and supports all the natural, economic, social and cultural factors that contribute to its balance.

Next steps: In the future, the reserve will aim to unceasingly promote and implement solutions to reconcile the conservation of biodiversity with its sustainable use and actions to limit damage from climate change, and will manage forest ecosystems to better adapt to climate change and all other altering conditions.

Agriculture is an important component of the lives of the local communities and SBR has developed a sustainable agriculture roadmap as a means to support the adaptation of local communities to climate change, dealing with its consequences, such as water scarcity and drought, through proper water harvesting and planting rain fed endemic crops. It also includes an important marketing component that will enhance the green growth of the local communities.

In addition to all the above-mentioned plans, current and future activities, SBR has started the construction of a "House of Biodiversity". It is destined to be a hub for the dissemination of knowledge on biodiversity and ecocultural practices and the commercialisation of products resulting from the application of these practices, generating income that will feed into socio-economic development and biodiversity management.

It is not only the use of the building that is linked to biodiversity, but also its structure whereby all the materials used come from biomass to cover the roof and some of the walls, in addition to the stones used in stonewall terraces. It will show how biodiversity, linked to traditional practices, delivers basic services and conditions that enable and support habitation.

Information linked to this case study can also be found through the PANORAMA initiative.

Adapting to climate change through community-led conservation

Customary Conservation Areas, Semau Island, Indonesia

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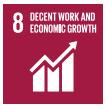
"*The People here are only willing to work on something that would benefit them. That is why I provide them the free sample of natural fertiliser so they could directly use it for their land. That way they will know the effect and try to make the fertiliser voluntarily.*"

– Mama Mariana Soled (female farmer from Uitiuhtuan Village) –

Background: Semau Island with an area of 265 km², located in the western part of Kupang District, the capital of East Nusa Tenggara Province of Indonesia, comprises customary conservation areas governed by community leaders (initiated since 2014) and surrounding government-protected areas including the Marine National Recreation Park (established in 1993) and the Sawu Marine National Park (established in 2009). With 11,756 inhabitants as of 2013, Semau Island contains 14 villages constituting two ethnic groups (i.e. clans) each of which has different cultural backgrounds and languages. As a lowland island surrounded by the Sawu Sea, and one of the world's richest coral reef areas, it hosts monsoon forests that provide tree species used for building materials, food and medicines, whereas farming and fishing support the livelihoods of the population. In the coastal communities, seaweed farming and fishing provide the main source of income. Short-term cash crops (e.g. fruits and vegetables) provide another source of income when freshwater from wells is available, while the locally grown staple crops (i.e. rice and corn) are the primary source of food and kept for family consumption. The common belief that the Semau people have magical powers has constrained development initiatives in the past, keeping government officials mostly away from the region.[88]

Sustainability challenge: Change in agricultural practices and land use with the limited freshwater supply on the thin soil layer has resulted in soil degradation, pollution, deforestation and biodiversity loss. At the same time, environmental and social vulnerabilities have increased due to climate change leading to extreme weather events, limited freshwater supplies and the impacts on a thin soil layer dominated by karst rock.[89] The use of agricultural chemicals has continuously increased over the past two decades, further degrading the quality of the naturally nutrient poor soil and harming local biodiversity both on land and sea through rainwater carrying chemicals to the ocean. Soil degradation has forced farmers

Co-benefit SDGs



Catharina Dwihastarini (UNDP/GEF SGP Indonesia), **Tamara Tschentscher** (UNDP Consultant), **Gregory Mock** (Independent consultant), **Diana Salvemini** (UNDP) and **Maiko Nishi** (UNU-IAS).

to regularly abandon farmland after five to six years of use for recovery of soil fertility. Consequently, deforestation has expanded due to land clearance for agricultural use along with population growth, furthering threats to biodiversity and land management.

Moreover, extreme weather events have increased in frequency in recent years, posing a disproportionate risk from climate change on biodiversity and local communities where annual precipitation ranging from 700-1,000 mm is the primary source of agricultural water and a limited number of wells offer drinking and bathing water.[90] Consequently, it is understood that dedicated efforts are needed to support a shift to more sustainable land and resource management regimes on the island, with a view to help the adaptation of local communities to climate change.

The customary conservation areas, together with the two marine protected areas, help to support climate change adaptation in multiple ways. This includes promoting restoration of mangrove forests to protect against extreme weather, watershed protection, sustainable seaweed farming and organic agriculture. In particular, the watershed conservation areas facilitate an increase in water access, improvement of irrigation systems and a decrease in agricultural chemical usage.

Conservation solution: Based on the clan-based land tenure system, a total of 67 hectares of forest has been placed under community initiatives and agreements to protect community resources and local biodiversity. For instance, a 3-ha water conservation zone in Batuinan Village is under the villagers' agreement through customary oaths to restrict the land lease for non-conservation purposes and limit the number of private wells in the surrounding area to raise the water table. The villagers have also agreed to plant about 1,650 mahogany trees in their family gardens to regenerate local forest cover. Additionally, an 11-ha area in Uitiuhana Village was dedicated by a clan leader as a nursery to raise endemic tree seedlings under a communal agreement that stipulates rules for forest management (e.g. trees cannot be cut for 20 years) and specifies a monitoring system. Moreover, 12 organic agriculture demonstration plots have been established across communities, where organic crops (e.g. bananas, eggplant and tomatoes) have been grown in an effort to increase market access and improve irrigation efficiency, leading to zero chemical inputs, less need for irrigation, and higher yields and prices of produce.

To support the adaptation to climate change further, information on weather and climate forecasts have been disseminated to the villagers to better inform their decision-making on agriculture, aquaculture and fishing. With a study on land cover and water supply and demand, more resilient plants and better seaweed cultivation methods have been introduced and practised at the demonstration plots, as potential alternative income generators. In collaboration with experts from Kupang District Agriculture and Fisheries Extension Agencies, extension services (e.g. information on agricultural practices provided by extension staff) have been improved and experience-sharing sessions have been regularly held. In addition, training and community education have been given to village governments and community groups with regard to seed preparation, water management and the use of fertilisers and pesticides.

Business case: Based on studies of the market opportunities for agriculture and aquaculture commodities on the Kupang and East Nusa Tenggara markets, an increase in market access for organic crops has been sought through organic agriculture with more efficient irrigation. This has resulted in about 20 per cent higher yields as well as higher prices for organic produce from the 12 demonstration plots. Also, seaweed farming has been improved through training in product manufacturing, packaging and storage methods. This has led to higher quality and quantity of seaweed for wholesale, and the development of seaweed-related secondary products with added value to the seaweed farming enterprise.

Lessons learned: Funded by the Japan Biodiversity Fund, the Community Development and Knowledge Management for the Satoyama Initiative (COMDEKS) programme implemented by UNDP in partnership with the Ministry of the

Environment of Japan, the CBD Secretariat and the United Nations University Institute for the Advanced Studies of Sustainability between 2011-2018 through the GEF Small Grants Programme promoted participatory landscape planning through community consultation. Under this approach, a set of 20 resilience indicators were used for conducting a baseline assessment, developing a landscape strategy, and identifying potential community actions at the landscape level. Through awareness raising and participatory planning, this has not only helped establish the customary conservation areas but also enhanced the government-protected areas for mangrove forest restoration, to provide additional coastal protection. In particular, the customary conservation areas allowed for new institutions built on the local land tenure system (e.g. communal agreements), which have mobilised environmental commitments by local clan leaders, village governments and community members. Community engagement and addressing governance issues are key to sustainable approaches to building landscape resilience.

Next steps: The formation of community groups as well as their commitments to environmental conservation have been confined to each clan and are yet to cut across the two different ethnic groups.[91] Nevertheless, seven environmental forums have built a mechanism for inter-village meetings to discuss issues reaching beyond the village level, which may possibly extend to an island-wide community to engage in biodiversity conservation. Bringing together multiple stakeholders including community leaders and government officials, these forums are also nurturing a foundation for collaboration and synergies between the customary conservation areas and the surrounding government-protected areas.

This case study was based on the observation of the COMDEKS programme implementation by the first four authors, plus written material and input from the partner communities on Semau Island.[92]

© UNDP

Seaweed

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Dry and critcial land

Case study

Conserving intact forests for climate mitigation and adaptation

Okapi Wildlife Reserve, Democratic Republic of Congo (DRC)

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Co-benefit SDGs

Tom Evans, Jean-Paul Kibambe and **Pacifique Madibi** (Wildlife Conservation Society).

"The intact forests of central Africa are key parts of the global carbon cycle – they contain huge stores of carbon, are active sinks absorbing more carbon each year, and are expected to be resilient to future climate change. It is essential to maintain the ecological integrity and function of these forests, including their wildlife populations, and we see the Ituri landscape as a great example of how this can be achieved in very challenging circumstances."

– Dr Emma Stokes, WCS Regional Director for Central Africa–

Description of the site: The Okapi Wildlife Reserve (OWR) lies in Ituri Province, in the north-east of the Congo Basin. It conserves the largest tract of intact lowland rainforest in the Democratic Republic of the Congo, covering 1.38 million hectares, and its legal zone of influence covers a much larger contiguous forest landscape of 4.02 million hectares. OWR has been declared a Natural World Heritage site in recognition of its exceptional ecological integrity, including the highest diversity of primates of any site in Africa (17 species), by far the largest remaining population of the okapi (*Okapia johnstoni* ~5,000), which is endemic to the DRC, and one of the last viable populations of forest elephants (*Loxodonta cyclotis* ~500) in DRC.

Sustainability challenge: The lowland rainforest protected by OWR is subject to severe threats of forest degradation and deforestation from uncontrolled in-migration driven by illegal artisanal gold mining within its boundaries, artisanal logging, and the use of land for shifting cultivation and cacao farming in surrounding areas. Furthermore, the bushmeat trade and ivory poaching are driving declines of many ecologically important species. These threats interact; gold mining by its very lucrative nature typically exacerbates armed conflict, destabilisation of local communities, and local population booms that exert further pressure on the forests and wildlife.

Key benefits: 95 per cent of the OWR and 79 per cent of the broader landscape are classified as "Intact Forest Landscapes",[93] indicating that they are very largely free of significant human degradation. These intact areas provide a huge range of benefits. From the perspective of climate mitigation, they secure exceptionally large carbon stocks and sinks.[94] Using a conservative average of 747 tCo_2equivalent/ha (tCo_2e/ha) including above ground and root biomass, OWR is estimated to store around 1.03 billion tCO_2e, and OWR plus the broader landscape together are estimated to store around 4.11 billion tCO_2e.

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Furthermore, intact forests across Africa are rapidly accumulating additional biomass (probably due to fertilisation by increased CO_2 levels in the air); as such, OWR is conservatively estimated to accumulate around 4.32 million tCO_2e per year, conservatively assuming that the sink only occurs within intact forest landscapes, and is equal to the annual average of 0.9tC/ha/yr found for tropical humid forests in Africa.[95] Intact forests across the broader landscape are estimated to accumulate around 10.47 million tCO_2e per year. For comparison, this active absorption by OWR and the broader landscape is equivalent to the annual emissions of 938,000 and 2.23 million cars in the USA, respectively.[96]

Intact forests such as this also underpin regional rainfall patterns (through the water vapour they release);[97] help to regulate major watersheds, limit the risk from new emerging infectious diseases,[98] and act as huge reservoirs of biodiversity.

Around 27,000 people reside within the OWR and have rights to farm and pursue other livelihood activities there. A quarter of these are Indigenous Mbuti and Efe forest peoples whose traditional hunting areas and other customary rights are respected. The broader landscape provides food, shelter and a way of life for more than 500,000 people with whom the future integrity of the OWR is inextricably linked.

The many benefits of these intact forests are further enhanced by their relatively high resilience to drought, storms and fires, stemming from their high integrity.[99] For example, their intact faunal communities help to ensure the continuation of many key ecological processes that ensure the health and structure of the vegetation.[100]

Conservation solution: The management goals of OWR have long been to prevent the occurrence of destructive illegal activities whilst enhancing the livelihoods of local resident communities, leveraging both the institutional strength of the protected area and the opportunities for community forest management in the surroundings. As road access improves, so the demand for land, timber, bushmeat and other resources from surrounding human populations grows and the OWR landscape faces rapidly intensifying threats. The Government of Congo signed a new partnership agreement with the Wildlife Conservation Society in 2018 for the management of the OWR.[101] This brought new hope for strengthened financial and technical support to combat the escalating challenges.

The OWR has been zoned through participatory processes. Core areas have been identified where human use is kept to a minimum. Surrounding these are large zones where the main permitted use is forest product harvesting, fishing and hunting by the Efe and Mbuti forest peoples, in

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accordance with their traditional practices. On the margins of the reserve and along the one significant road corridor through it, agricultural zones have been agreed and demarcated around long-established villages. The OWR authorities organise intelligence-led law enforcement patrols and other activities to minimise illegal activities, and also support community development programmes that provide assistance with, among other things, improved agricultural techniques and processing/marketing, as well as support to health and education services.

In the broader landscape, the emphasis is on support to the establishment of community forest and land tenure, as well as livelihood assistance and targeted law enforcement activities. The reserve team works closely with the local authorities, and is integrating conservation into provincial development planning including the provincial REDD+ strategy.[1]

Financing for the reserve is a long-running challenge, because state budgets for protected areas remain limited – per capita, DRC is one of the poorest countries in the world – and chronic security challenges make ecotourism unfeasible. Since its inception, OWR has primarily been supported by international biodiversity funds from public and philanthropic sources. As the climate value of intact ecosystems becomes better recognised,[102] international climate finance may increasingly become available as well. Whilst bringing increased threats, improved road networks also bring the possibility for private sector investment in sustainable agriculture models in selected parts of the landscape, benefitting both livelihoods and the environment.

Lessons learned: Experience in OWR has shown that the existence of the protected area, and the vision for its future, have been very valuable concepts to inspire action, collaboration and investment by many stakeholders, from the local to the international scale, over many years. OWR has experienced severe challenges since its creation in 1992, including periods of war and near total societal breakdown, but continues to retain its key values, as a result of a long-term commitment to the values of the reserve by several institutions and many courageous individuals, and as a result of sustained efforts to link communities, including Indigenous people, with reserve management.

Next steps: The new phase of management will enable new strategies and an increased level of investment to address illegal gold mining, elephant poaching and other linked threats. This will be underpinned by an investment plan for the long-term management of the OWR and its buffer zone that will protect its forests and promote sustainable economic development in the larger landscape. Development opportunities include legal artisanal mining outside of the OWR, alternative skills building through business and small enterprise capacity building, and the creation of new markets for other supply chains, including agricultural and agroforestry products.

The Wildlife Conservation Society (WCS) has been active in the OWR for more than 30 years, supporting its creation and subsequently working closely with ICCN (Institut Congolais pour la Conservation de la Nature) — the government agency responsible for protected areas and wildlife — in its management.

1 REDD+ stands for (in brief) "Reduced emissions from deforestation, forest degradation and other activities" and represents a mechanism under the UN Framework Convention on Climate Change to provide positive incentives to support developing countries improve forest protection and management.

Protecting and restoring the Mesoamerican Coral Reef to improve climate resilience and adaptation

Network of marine and coastal protected areas, Quintana Roo, Mexico

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Co-benefit SDGs

Fernando Secaira and **Mark Way** (The Nature Conservancy).

Background: Stretching over 1,000 km, the Meso-American coral reef is the second longest barrier reef system in the world, home to 500 fish and 70 coral species. It is considered a critically endangered ecosystem by IUCN and provides habitat for numerous threatened and endangered species such as sea turtles and whale sharks.

Reefs also sustain the tourism industry in the Mexican Caribbean, the most important destination in Mexico, attracting more than 12 million visitors per year and sustaining the US$12 billion tourist economy of Quintana Roo.

A comprehensive network of well-managed marine and coastal protected areas, stretching from the Yum Balam and Whale Shark Biosphere Reserves in the north to Xcalak Reef National Park and Manatee Marine Reserve in the south, is core to maintaining the health of the reef, and therefore its ability to protect the coastline. National parks protecting reefs include Puerto Morelos, Cancun-Nizuc and Isla Mujeres, Kian Ka´an, Xcalak and Cozumel; the whole regional tourism industry depends on them.

Sustainability challenge: Climate change is causing sea-level rise and stronger tropical storms, exposing communities to coastal flood risk and beach erosion, and at the same time it threatens the health of the coral reef. Coral reefs can reduce more than 90 per cent of wave energy during storms[103] protecting coastal communities and infrastructure. Reefs also reduce 40-65 per cent of off-shore wave energy under normal conditions,[104] protecting beaches from steady erosion. However, hurricanes can diminish live coral cover from 15 to 60 per cent[105] and reef complexity in a few hours.[106]

Ensuring the health of the Mesoamerican Reef, including having a well-managed network of protected areas in place, improves the physical and financial resilience of the area to climate-driven storms. Healthy reefs provide coastal protection, reduce damages to communities and tourism infrastructure and sustain businesses, jobs and livelihoods.

If reefs are degraded, losses to infrastructure from storms with a 10 to 100 years return period could double.[107] If dunes are removed, losses will increase from 42 per cent to 63 per cent. Seven protected areas have been established along the Mexican Caribbean to

protect coral reefs, reducing some threats, such as overfishing and regulating boat traffic and tourism. Despite these efforts, the reefs have lost 80 per cent of live coral cover.[108] Ensuring continued protection and restoration of the reef after damaging incidents is essential to strengthen Quintana Roo's resilience to climate change.

Conservation solution: The National Commission of Natural Protected Areas (CONANP) and The Nature Conservancy (TNC) are working to address the threats to coral reefs within the protected areas network and expand ongoing reef and dune restoration efforts to secure the Mesoamerican Reef and allow it to provide the maximum level of protection to the communities.

Building local capacities and awareness are essential to scale up restoration efforts. CONANP, TNC, UNAM (National University) and the National Fisheries Institute (INAPESCA) have developed guidelines on how to restore dunes and reefs for coastal protection, how to design beach erosion projects considering natural systems and how to repair reefs after a storm. This consortium, under TNC leadership, is training tourism-oriented consultants, reef managers and hotel staff on how to implement such projects.

The response from the hotel industry and local communities has been very positive, with more than 60 fishers and tour operators trained in post-storm response, 60 hotel gardeners trained in dune vegetation management, and 80 private and state representatives on reef restoration for coastal protection.

In addition, an innovative financial solution developed by the state of Quintana Roo, TNC and other partners demonstrates how coastal ecosystems can be insured to provide for enhanced reef management and protection. The policy is based on protecting a marine ecosystem and maintaining its capacity to wave attenuation as an ecosystem service. The insurance covers 167 km of coastline of six municipalities and their towns – Cancún, Puerto Morelos, Playa del Carmen, Tulum and Cozumel. The parametric insurance product – whose pay-out is automatically triggered by a given storm strength – supports critical work to reduce and repair damages to the reef after a storm. This is essential to ensure that the protective potential of the reef is restored even after a catastrophic event.

After building local capacities, additional reef and dune restoration efforts are spontaneously emerging, many financed by the hotel industry. A group of hotel owners is embracing the importance of dune and reef restoration and is committing resources to protect and restore them.

For the post-storm response, CONANP, the Research Center for Aquaculture and Fisheries (CRIAP-INAPESCA) and TNC developed a protocol[109] to repair the reefs after a storm, established the governance to lead a response and trained 60 brigadists to conduct a post-storm response. These brigades will be mobilised after a damaging weather event to remove debris from reefs to prevent further damage (such as sand, loose stones or broken corals and other objects washed into the ocean); fix and consolidate loose colonies and broken fragments; and collect broken pieces and set up nurseries for future transplanting. If this response is implemented up to 60 days after the storm it will greatly increase chances for the coral to survive and recover while reducing the overall damage that the storm has caused.

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Securing corals to the reefs helps to restore them after a hurricane.

Business case: The reef reduces exposure to coastal flood risk from tropical storms and stabilises beaches to protect the US$12 billion per year tourism industry along the coastline of Quintana Roo. Restoring the reef is estimated to be at most half the cost of the grey infrastructure needed to provide equivalent protection. Furthermore, much of the existing built infrastructure for coastal protection is situated within the national parks; restoring and improving the capacity of natural ecosystems to provide coastal defence is more in line with the conservation, tourism and recreational objectives of the parks.

Rigorous studies led by the University of California Santa Cruz (UCSC), Institute of Hydraulics University of Cantabria (IHC), the Autonomous University of Mexico (UNAM) and TNC have shown the value of the Mesoamerican reef for risk reduction.[110] The reef's risk reduction value to properties and people protected along the coastline behind it is the foundation for building local capacities to restore reefs and dunes, to increase awareness and interest in the tourism industry to implement them and of the development of the first weather risk insurance placed in the market.

Lessons learned: The tourism industry is willing to work to sustain the natural capital on which their income depends. One frequent barrier, however, is a lack of financial information to compare the cost of natural solutions with traditional practices and infrastructure. Developing local capacity to use natural systems to reduce the risk from beach erosion and storms is also a challenge. But when these needs can be met, i.e. when information and capacities are achieved, then a change in attitudes and practices can take off. Several hotel owners are increasingly supporting reef and dune management within natural protected areas of their own accord.

Through the project and the introduction of the insurance contract, institutional

Case study

Economy of the Yukatan Peninsula is reliant on healthy beaches and coral reefs.

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governance was strengthened around the management of a trust fund. This fund is designed to be able to accept different forms of funding for the protection and repair of coral reefs and the adjacent beaches – a source of finance that did not exist before in this transparent manner.

Insurance and the trust fund are risk transfer and financial instruments that work to help fund comprehensive management of the reef and coastal zone. The scope of work within the coastal risk and resilience initiative, by parks management and partners, encompasses reef and dune restoration, Sargasso removal, attention to diseases and fishing control.

Next steps: CONANP, TNC and partners will continue building the capacities and awareness of the tourism industry and will support them in the implementation of the reef and dune restoration projects within and nearby protected areas. The work will also expand well beyond Quintana Roo: TNC is building reef brigades in Belize, Guatemala and Honduras and will expand the brigades elsewhere in Mexico – to 180 team members in the four countries.

Ongoing monitoring is being conducted. The Healthy Reef Initiative,[111] in partnership with marine protected areas, research institutions and community leaders, has had a monitoring protocol in place since 2006. This monitoring programme, which tracks changes in reef health over time, will allow assessment to determine if the anticipated risk reduction benefits materialise and coastal resilience increases.

Information linked to this case study can also be found through the PANORAMA initiative.

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Sustainable and healthy societies

SDG 1: No poverty

Summary for policy makers

Poverty remains an underlying cause of many of the wider environmental and social challenges that the SDGs seek to address, including many environmental problems. Therefore, contemporary approaches to conservation acknowledge that attempting to address these challenges without also addressing poverty is likely to be unsuccessful. On the other hand, the latest UN estimates conclude that the world is not on track to end poverty by 2030,[1] which means that additional approaches contributing to poverty reduction are needed, including those building on the conservation of natural capital.

While poverty is multidimensional and influenced by more than just money (e.g. subsistence, political, environmental, cultural and spiritual dimensions), this chapter focuses mainly on the economic aspects of poverty and discusses how effective area-based conservation can contribute to poverty reduction strategies, through:

- Tourism and ecotourism
- Direct and indirect employment
- Collection and sale of wild products
- Sustainable agriculture, grazing and agroforestry
- Maintenance of ecosystem services through Payment for Ecosystem Services (PES), including REDD+ and similar schemes for carbon and water

There is no one category or governance type of protected area that is most suited to supporting economic activity. However, tourism tends to be focused particularly in IUCN management categories II and III, and also in V, protected landscapes and seascapes. Collection of wild products within natural ecosystems fits particularly into IUCN category VI, sustainable use areas, and the category was designed explicitly for this purpose. Category V is the management approach most closely linked to the use of sustainable agriculture within protected areas. Additionally, many areas likely in the future to be recognised as OECMs provide a key role in supporting Indigenous people and other local communities and helping them to move out of poverty.

What is the challenge?

Poverty remains endemic throughout the world, both in rich and in poor countries. There are around three-quarters of a billion people – one person in ten – surviving on a daily income of less than two dollars (US$1.90 is used as the standard definition of absolute poverty by the World Bank and in the SDGs). It is important to stress that poverty is not only about money, but includes other variables, such as unemployment, ill health, lack of education and social exclusion.[2] 1.3 billion people around the world live in what is known as "multidimensional poverty";[3] a definition that goes beyond income to look at issues such as poor health or malnutrition, a lack of clean water or electricity, poor quality of work or little schooling.[4] The United Nations is clear in its conclusion that: "*The world is not on track to end poverty by 2030*".[5]

Poverty affects women, and particularly children, to a disproportionate extent and is also geographically skewed; 80 per cent of people living in absolute poverty are in sub-Saharan Africa, and many are children.[6] At least half the world remains "poor", even if entry to the middle classes is assumed to start at an income per person of US$11.00 per day,[7] which most of the people reading this report would struggle to get by on. Poverty in rural areas is three times as high as in urban areas.[8] Over half the population of the world have no access to social protection such as pensions or healthcare.[9]

There have been important changes, and the number of people in extreme poverty has fallen over the past decades,[10] although some analysts question the extent to which these reductions mark real improvements in the condition of the poorest,[11] and the 2020 pandemic has been making the situation worse. Furthermore, poor rural dwellers in many parts of the world are finding themselves at an increasing level of insecurity. Poor people are vulnerable in multiple ways, including from hunger, from poor water and sanitation, from lack of healthcare and from lack of education. Poor people also generally suffer far worse effects in the case of natural disasters. Research shows that 80 per cent of the poor in Latin America live on marginal land, with 60 per cent doing so in Asia and 30 per cent in Africa.[12] When disaster strikes, these communities are the first to take the brunt. For example, before the major tsunami hit Indonesia in 2004, a third of the population of Aceh and Nias Provinces lived in poverty; this was pushed up to almost half in the aftermath of the disaster.[13]

Many apparently intractable environmental issues such as deforestation, bushmeat hunting, land degradation and desertification are impossible to address effectively when many people lack the basic essentials of life. The poorest people do not have the luxury of considering long-term, and to them largely conceptual, issues of resource security and sustainable development when they face daily shortages of food, medicines and shelter. When poverty is associated with lack of land tenure, any incentives to manage land or water for its long-term benefits quickly disappear. Poor people are the foot soldiers in the massive illegal wildlife trade, taking the risks in poaching and trafficking endangered wildlife whilst enjoying few of the profits.[14] They are more likely to migrate, in a desperate search for better living conditions, adding to social and environmental problems in cities already breaking under the strain of too many people and too few resources. Rural–rural migration is another important and often undocumented cause of environmental degradation.[15] Social inequality is bad for the environment, which may in turn explain why societies with more inequality often appear to be less healthy.[16]

Addressing poverty, then, is not just an urgent need from a moral or humanitarian perspective. The continued existence of global poverty affects everyone in myriad ways, not least through its role in degrading the ecosystem services we all depend on. Poverty reduction strategies are fundamental to many of the other issues examined in this report.

Poverty impacts on almost all the threats to well-functioning ecosystems discussed in this guidance.[17] For example, population growth, urbanisation, refugees and poverty keep many city dwellers dependent on fuelwood for heating and cooking, resulting in rapid forest degradation, and sometimes deforestation.

Woodfuel supplies over 80 per cent of household fuel in Africa and accounts for over 90 per cent of harvested wood. This also impacts human health and the achievement of SDG 3: household air pollution from burning solid biomass caused more deaths than malaria in 2010.[18] Population growth or an influx of refugees can lead to rapid increase in woodfuel use, as in Abéché in Chad and Kinshasa in the Democratic Republic of Congo, which are experiencing huge population increases due to conflict and rural poverty, creating rapid deforestation.[19]

Poverty is also by far the most important cause of hunger in the 21st century and thus interconnected with the achievement of SDG 2,[20] with poor people unable to afford enough food. Paradoxically, there is also an apparently perverse relationship between poverty and obesity: with lack of education coupled with aggressive sales drives meaning that many poor people are badly nourished on cheap foods and in consequence obesity is a problem now impacting virtually every country in the world.[21] The risks of hunger amongst the poorest are also increased by climate change or other environmental disturbances, linking SDG 1 with SDGs 11 and 13. A bad harvest, inclement weather, pest attack or the vagaries of the market can suddenly leave people with insufficient food to eat or no surplus to sell for essentials like healthcare and children's education.

Climate change can further exacerbate poverty and undermine poor people's ability to manage land and livestock sustainably.[22] It has long been recognised that the poorest people are the most vulnerable to climate change,[23] and yet for the most part they contribute the least to this threat. Swept up in rapid modernisation, often pushed further into inhospitable territory and with traditional kinship and land management systems breaking down in consequence, poor people are left with few options.[24]

Finally, poor people tend to get pushed into the margins, where they are additionally disadvantaged. The "margins" may be the shanty towns surrounding major cities, or the least hospitable ecosystems in rural areas, places vulnerable to floods or landslides, or areas of conflict and rampant criminality.

Poverty in the drylands for instance is often made worse by long-term neglect of these areas, which are regarded by governments as being of "low potential", meaning that resources are channelled elsewhere leaving drylands starved of investment. Poverty levels in the drylands, measured in terms of literacy rates and health indices, are above average in many countries.[25] When desertification leads to lower food production, it contributes to national poverty and the vulnerability of the poorest communities. This creates a vicious circle since the poorest farmers also face the greatest challenge in addressing land degradation.[26]

SDG 1 aims to eliminate extreme poverty by 2030. But true to the wider definition of poverty, it also has wider aims: to halve the number of people living below national poverty lines (Target 1.2), to reduce multidimensional poverty and to increase the number of people with social safeguards and access to basic services and secure land tenure (Targets 1.3 and 1.4) and reduce direct economic loss from natural disasters (Target 1.5). Goals related to subsistence, access to land and protection from natural disasters are addressed under SDG 2, SDG 10 and SDG 13 of this guidance, whereas this chapter focuses on the various ways in which area-based conservation, including particularly protected areas and OECMs, can contribute to economic, cultural and spiritual benefits helping to reduce poverty.

How can effective area-based conservation help?

Many protected areas can contribute to poverty reduction strategies directly, by providing employment and economic opportunities amongst resident and local communities.

Tourism or ecotourism is the commonest source for raising income from protected areas and remains a critically important value.[27] It has been estimated that protected areas generate over US$600 billion per year in revenue from visitors.[28] Tourism is the largest source of foreign exchange for a

number of countries, for instance in Rwanda.[29] Sometimes the benefits are spread widely across society,[30] in other cases they only benefit a minority. The most secure forms of tourism income are probably those that draw mainly from domestic tourism, as in the case of South Korea where around 97 per cent of tourists to national parks come from within the country,[31] being much more resilient in the face of sudden economic downturns or similar changes. A single species can be the driver of a whole local industry: the return of the osprey (*Pandion haliaetus*) to a reserve in Scotland created the equivalent of 87 associated jobs and over US$3 million a year.[32] Ranthambore National Park was the first designated tiger reserve in India and remains one of the most visited. The surrounding area supports 3,000 tourist beds and tourism revenues are over half a million US$ per year, increasingly from domestic tourism.[33] Associated industries are also important, such as handicrafts and locally collected products sold in and around protected areas, hotels,[34] guest houses, homestays, cafes, guiding and associated activities.[35] However, tourism is also particularly sensitive to disruption. A single act of terrorism can undermine national or regional tourism strategies for years and the COVID-19 pandemic has thrown tens of millions of people involved in ecotourism out of work.

Direct and indirect employment by and investment generated by protected areas can also be significant, particularly in rural communities where other opportunities may not exist. For example, employment created by China's panda reserves is an important contributor to rural income in parts of Sichuan. A 2017 study of almost a thousand households in 16 reserves found that employment increased mean household income by US$140 inside reserves where the average income per capita is US$930.[36] Sichuan's 46 giant panda reserves employ over 2,800 staff as rangers, guards, etc.[37] Protected areas can also bring in significant investment and create jobs related to biological and other forms of research.

Unfortunately, the success of protected areas in reducing poverty through protected area related employment and investment – and also tourism – is closely tied to the quality of governance and the rule of law in a country. In places where corruption and illegality are rife, money generated through protected areas is often siphoned into the pockets of the most powerful, while poorer or politically weaker groups are left out of the bounty.[38] Consequently, good governance is a key for ensuring that the benefits materialise in practice.

Collection and sale of wild plant and animal products in processed or unprocessed form support local economies in both developing and developed countries. An increasing number of protected areas are managed in a way that facilitates local sustainable collection of products, ranging from nuts,[39] honey[40] and other non-timber forest products,[41] through high-value items like turtle eggs[42] and medicinal products.[43] Perhaps the largest of all is the support marine and freshwater protected areas provide for fisheries,[44] described in detail in the chapter on SDG 14.

Sustainable agriculture, grazing and agroforestry remain major land-uses in many protected areas where such activities are allowed (IUCN category V),[45] including the *Satoyama* sites in Japan,[46] in conservancies throughout southern Africa, and elsewhere. Some areas under sustainable agriculture may also qualify as OECMs, if they support high levels of biodiversity, such as low-level grazing on natural pastures. If managed carefully, domestic livestock and wild animals can co-exist in the long term and this can be a way of reducing social and economic tensions around conservation. Additionally, some traditional forms of production, such as cork oak forests in the Mediterranean[47] or traditional vineyards,[48] may also support high levels of biodiversity. However, this does not imply that all forms of sustainable agriculture are also OECMs, but only the subset that meets all the requirements of an OECM.

Maintenance of ecosystem services are supported by economic compensation via **payment for ecosystem services** (PES) schemes including particularly carbon through REDD+ schemes[49] and water through agreed PES schemes[50] often associated with municipal water suppliers or private water companies. This is a rapidly developing field, with many schemes still in the process

of development, and is addressed in more detail under chapters on SDGs 6 and 13. It potentially offers a lifeline for many protected and conserved areas; giving local communities an incentive to conserve and covering management costs, but the practical problems of running such schemes are sometimes considerable. Ecosystem services can also have direct economic benefits. In the Azores Islands, part of Portuguese territory, the Pico de Vara/Ribeira do Guilherme protected area has improved water quality, so that it now exceeds legal requirements for potable water. Previously many people bought bottled water, so improved water quality has led to important savings; total benefits from water quality are estimated at €110,000 (US$127,000) per year.[51]

Approaches that support SDG 1

Research shows that any category or governance type of protected area can play a role in generating economic returns, and all have roles in addressing some of the wider interpretations of poverty discussed above. However, some types of protected and conserved areas are more closely linked to particular activities and we outline these below.

Protected areas

- **Category II, III and V protected areas, privately protected areas and ICCAs involved in ecotourism**: Category II protected areas – the classic national parks of North America and Africa, are designed in part to provide places for people to explore nature and many deal with mass tourism, which itself can if not properly managed be a conservation threat. Countries are increasingly building rural development strategies around such places. In Europe, where the national park model has developed with significant differences, category V protected areas are generally cultural landscapes complete with settled human communities that nonetheless have important nature conservation values. Again, these areas are almost all a major focus for ecotourism. Category III, natural monuments, are generally smaller and based around one specific feature, and many also cater for tourists in a major way.
- **Category VI protected areas used in the collection of wild products**: Category VI, sustainable use areas, emerged from the concept of "extractive reserves" in Latin America,[52] developed explicitly to combine the collection of one or more, usually high value, natural products from an otherwise natural ecosystem. Initially this was rubber, but nuts, berries and fish are all common factors in the designation of category VI.
- **Category V protected areas for sustainable agriculture**: Experience with mixing agriculture and conservation are mixed; in some cases, the results are disastrous for wildlife and natural vegetation while in others co-existence has proven mutually beneficial. This is a rather grey area, where protected and conserved areas blend gradually into sustainable use, but it is clear that many protected areas do include large areas used for grazing and also some areas of agriculture. In some cases, such as the interaction of nomadic pastoralists with protected areas, the agricultural elements become an integral part of conservation strategies.[53]

OECMs

- **OECMs for sustainable agriculture, wild food collection, etc.**: Including some areas outside protected areas where management supports high levels of biodiversity. The IUCN guidance recognises: "*Traditional management systems that maintain high levels of associated biodiversity. These could include certain agricultural or forest management systems that maintain native species and their habitat*".[54] This does not imply that all forms of sustainable agriculture are OECMs.
- **OECMs associated with ecotourism**: Including many conservancies, privately run nature areas and buffer zones of protected areas that provide useful income for local communities, and also serve to relieve pressure from designated protected areas.

Case study

Supporting area-based conservation as a means to reduce poverty and improve food security

Multiple protected areas, Lao

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Co-benefit SDGs

Nigel Dudley (Equilibrium Research and IUCN WCPA) based on a case study provided by the World Bank.
Stephen Danyo, **John Parr** and **Gianni Ruta**, (The World Bank Group).

Background: Laos is one of the most biodiversity-rich countries in south-east Asia, with high levels of endemism. There is still a great deal to be learned about the distribution and status of species, with new discoveries happening all the time. Laos has an estimated 8,000-11,000 plant species, between 150-200 species of reptiles and amphibians, 700 species of birds, 90 species of bats, over 100 species of large animals and 500 species of fish. Fish diversity in the Mekong River is estimated to be roughly three times that of the River Amazon, and several indigenous species are considered suitable for aquaculture. There is no list of fungi despite their nutritional importance in diets, little known about invertebrates and all species lists are incomplete. It is estimated that 40 per cent of species depend on forest ecosystems. Some 319 species are considered to be of global conservation significance: including 67 per cent of large animals and 53 per cent of bats.[55]

Protected areas listed on the World Database on Protected Areas cover 3.86 million hectares (16.7 per cent of land cover).[56]

The Laos legal system recognises Conservation Forests for nature and biodiversity.[57] Twenty National Biodiversity Conservation Areas have been designated, but no complete inventory exists for provincial or district protected areas. Two national parks – Nakai-Nam Theun and Nam Et-Phou Louey – were both designated in February 2019, being the first such reserves in the country. Hin Nam No National Park was designated in January 2020, a site protecting Indo-Chinese karst which is being assessed for natural World Heritage site designation.

With the exception of a small number of introduced fish used for aquaculture, almost all of the fish species caught in the Lao PDR are indigenous species. About 500 indigenous fish species are reported for the Mekong River and its tributaries in the Lao PDR and, of these, nine species are threatened, and 25 species are suitable for aquaculture.[58]

Sustainability challenge: Habitat loss and degradation are the primary threats to the survival of wildlife in Lao PDR and are mostly caused by the expansion of agricultural land, forest product extraction,

infrastructure expansion and fires. Snaring is particularly intensive in the Annamite mountains, bordering Vietnam. This threatens both wildlife and human livelihoods. Finding the balance and adopting a path of truly sustainable development are urgent priorities.

Rapid development is destroying natural ecosystems and putting species at risk, including those used by many of the poorest members of society for subsistence. The Lao Red list was last updated in 2009 with the highest level of protection identified as necessary for 44 mammal species, 34 birds, eight reptiles, one amphibian and seven fish species. Examples of species on this list for the highest level of protection include the Irrawaddy dolphin (*Orcaella brevirostris*), saola (*Pseudoryx nghetinhensis*), great hornbill (*Buceros bicornis*), Siamese crocodile (*Crocodylus siamensis*), Mekong stingray (*Dasyatis laosensis*) and the Lao salamander (*Paramesotriton laoensis*).[59]

Laos still has large areas of forest although the rate of conversion is increasing, particularly to annual crops (maize, cassava, sugarcane) and to commercial perennial plantations (rubber, coffee, cacao, pepper) for both regional and global markets.[60] Shifting cultivation is practised by nearly 70 per cent of the population; it is not a significant driver of deforestation but causes forest degradation,[61] which is itself often a precursor to conversion.[62,63] When plantations are established on fallow lands, communities often go further into forests to clear land for farming.[64] The logging ban has been augmented by two Prime Minister Orders; namely PMO 15 controlling the harvesting of timber (2016)[65] and PMO 05 on controlling wildlife trade (2018).[66] However, illegal logging continues and sometimes granting of agricultural concessions has been used as a mechanism to get around the ban.[67] Around half a million hectares of industrial tree plantations have been established in Laos;[68] although these are legally allowed only on degraded or barren land, in reality they are often established on forested land.[69]

Although there is a protected area system, management capacity and thus management effectiveness remain low, and the need for a major capacity building programme has been identified.[70]

Although developing fast, Laos remains a poor country, with the majority of the population still at least partly dependent on subsistence from natural resources. Almost half the rural income in 2009 came from sale of non-timber forest products and most households also rely on them for subsistence.[71] While the proportion may be reducing, recent detailed surveys in four villages found "environmental income" averaging 23 per cent across all wealth classes, and loss of natural ecosystems was thus being contested by local communities.[72]

Conservation solution: There is a need to establish a management framework that secures a sustainable and equitable access to natural resources in Laos. A secure and well-managed system of protected areas is seen as the cornerstone of efforts to maintain natural ecosystems and their associated benefits, with benefits in terms of a wide range of ecosystem services. Many of these protected areas contain human communities, so effective conservation necessarily involves working with these people, supporting their livelihoods and promoting development pathways that do not undermine long-term conservation objectives.

The Second Lao Environment and Social Project is a US$38.83 million World Bank (IDA) and Global Environment Facility (GEF) funded project, aimed at strengthening management of protected areas, wildlife law enforcement and environmental protection systems, notably by improving the capacity and coordination between public institutions, civil society and concerned communities to manage protected areas and to enforce wildlife laws.

It supports 11 protected areas in seven provinces that cover 1,297,000 hectares and provides further support to the Lao-Wildlife Enforcement Network (Lao-WEN). This includes assisting community-based conservation across 190 villages. These communities are extremely diverse, with 28 languages from four major linguistic groups recorded in just one of the protected areas.

Case study

Through an inclusive and participatory approach, communities suffering from high poverty and malnutrition rates are provided livelihood support in return for voluntary agreements to eliminate hunting of threatened wildlife species and felling trees in some areas.

The project is also supporting the development of the first environmental curriculum for the National Academy of Politics and Public Administration (NAPPA) to raise awareness of Lao's environmental policies and international best practice, thus, reaching high-level decision makers in an unprecedented way.

Lessons learned:

- The National Protected Areas receive US$5,000 /year from government funding streams, while government staffing levels to each protected area rarely exceed eight personnel, and on occasion can be none. Consequently, site selection of targeted donor assistance needs to be carefully considered.
- Multi-level collaborative management systems – linking the provincial authorities, district authorities and individual villages – were much easier to establish and implement in the smaller provincial managed reserves than in the two national parks, which overlap two or more provinces.
- The establishment and mobilisation of "district technical teams", which combine government staff with district partners, has proven a main-stay of all protected area activities at the field level, in all sites. It very probably is a critical institutional body for blending the technical expertise of the protected area, with the existing administrative management system of the government, but is poorly understood in international conservation literature.
- Selection for development assistance in the targeted national parks and protected areas is based upon three criteria, namely (i) enclave villages, (ii) villages with overlapping lands with the protected area and (iii) villages with their boundaries abutting the protected area.
- Biodiversity threat assessments should be undertaken with the target district authorities and target villages prior to village assistance delivery. This orientation facilitates understanding that the limited livelihood assistance will be directly linked to threat mitigation of the priority threats within each reserve in question.
- Village and forest land use planning is an important field activity in which to embed any meaningful livelihood development assistance. The activity is most effective if it is conducted in a phased process, to strengthen village ownership and understanding of the village plans developed.
- Village conservation agreements were used to strengthen village commitments to conservation values. However, the far more significant aspect should be the monitoring of changes in attitudes (through pre- and post-attitude testing), and behaviour, within the target villages.
- Village grant development assistance might be more effective if it involved delivery mechanisms as tranches, or as revolving funds, as opposed to single grant payments, but were constrained by the short project duration (generally three years in the 11 sites).
- The village development grants, if targeted into the buffer zones of protected areas, can assist with (i) poverty alleviation, (ii) biodiversity conservation; (iii) protection of tourism assets and climate-change mitigation simultaneously. Hence this development assistance should be promoted with rural development NGOs in the country, and internationally.
- Outreach is one of the most important technical fields of protected area management, and is particularly significant in collaborative management, where villagers, district partners and other stakeholders are intimately involved in management. Outreach can be tailor-made targeting villagers, schoolchildren and law enforcement partners. The country has extremely limited expertise in this field, which is possibly a regional phenomenon.
- Guidelines were formulated for different aspects of protected area management by the leading experts in the country in these respective fields, including: (i) participatory management planning, (ii) village and forest land use planning, (iii) outreach, and (iv) livelihood development

linked to conservation. They proved very useful to guide the national consultants providing technical assistance as well as the government staff and district partners.

- An evaluation should be undertaken towards the end of project implementation, in order to clarify the lessons learned – both positive and negative – for the final phase.

Next steps: The management of the nascent national park system should be centralised to shift towards technical assistance being provided by central level (through training of trainers) in (long-term) preference to the ongoing site-level technical assistance. A Master Plan for Protected Areas (2020-2025) should be developed to assist prioritising the protected areas sites to be assisted with limited development assistance; often donors have prioritised sites of very low conservation values. Factors for determining site selection should include (i) international biodiversity values; (ii) the potential of tourism concessions (economic factor) and (ii) capacity building values – at the national level. Protected areas situated close to Vientiane should be prioritised, to strengthen decision-makers' support for the national park movement, and the profession of "national park rangers". The development of guidelines should be expanded to cover all aspects of protected areas management (and the questions in – and outside – the METT tracking tool[1]). These guidelines should be individually augmented by the development of practical field manuals to assist implementation at the field level. Target sites should be selected for protected area management assistance with a seven-year time-line. This time-line will ensure improved understanding of these complex protected area management systems, including embryonic buffer zone management, and offer a much higher likelihood of delivering sustainable protected area outcomes.
These issues outlined above have all been incorporated into the design of the proposed Lao Landscapes and Livelihood (LLL) Project.

[1] The Management Effectiveness Tracking Tool (METT): https://www.protectedplanet.net/en/thematic-areas/protected-areas-management-effectiveness-pame?tab=METT

Case study

Indigenous protected areas helping to rebuild communities in Australia

Warddeken Indigenous Protected Area, Australia

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Co-benefit SDGs

Nigel Dudley (Equilibrium Research and IUCN WCPA) and **Hannah Timmins**, with input from **Shaun Ansell,** Warddeken IPA.

Background: Indigenous Protected Areas (IPAs) are a system of land and water tenure designed to help Australia's "closing the gap" policy,[73] addressing hundreds of years of discrimination against Indigenous Australians. IPAs first emerged around twenty years ago[74] and are self-declared protected areas on Indigenous lands, which aim to combine biodiversity conservation and the provision of ecosystem services with poverty reduction, policies to reduce inequalities in wealth, improved healthcare, education and employment. IPAs have grown dramatically over the past twenty years[75] and now cover 46 per cent of Australia's National Reserve System (over 740,000 km² well over 20 per cent of Australia's landmass).[76] Along with Australia's closely related Indigenous Advancement Strategy (IAS), IPAs generate important opportunities for training and employment, as rangers, wildlife officers, scientists and tour guides. Importantly, IPAs have a high employment retention rate, at approximately 80 per cent, bringing much-needed stability to isolated and disadvantaged communities. IPAs also provide important and often large-scale conservation areas in parts of the country often missed by the state protected areas system.

Sustainability challenge: Social inequality in Australia has led to major differences of health, wealth and opportunities between Indigenous and non-Indigenous Australians, with the former experiencing dramatically lower life expectancy and a range of social and health challenges. "Poverty" in these circumstances is a complex concept that includes financial situation and economic opportunities but is also influenced by issues relating to people's ability to live the life they choose.[77] Access to land is particularly important here and is a critical part of moves to improve the social conditions of Indigenous Australians. Changes in land tenure have in turn led to a switch in some areas from extensive pasture management back to more traditional uses, including protection.[78] At the same time, Australia is amongst the countries responsible for the highest losses of biodiversity,[79] exacerbated by increases in fire frequency,[80] and there is an urgent need for additional protection and management changes over large areas.

Warddeken is a typical example of an IPA,[81] registered under the ownership of the Nawarddeken people in 2009 and managed by the Indigenous owned Warddeken Land Management Ltd (WLML). Covering around 1.4 million hectares of stone and gorge country in West Arnhem Land, Northern Territory, the land is of high biodiversity significance and contains important cultural, rock art and archaeological sites.[82] However, like many IPAs the resident people face economic hardship and there is a high level of unemployment. Here, the protected area is already in place, but the challenge is to provide enough financial resources and incentives to ensure that it continues to be well-managed over time.

Conservation solution: The IPA estate includes many of the highest conservation priority areas in Australia.[83] The IPA concept will only work if it simultaneously provides support for communities – economic and social – alongside conservation. The solution here is to use existing government funds to create management and other jobs for local people and to develop Payment for Ecosystem Services schemes, in this case particularly related to carbon abatement and sequestration, to generate additional funds. Moreover, studies indicate Indigenous Australians working "on country" (i.e. in nature through programmes like IAS) have improved mental and physical health,[84] and often reduced risks of diabetes and kidney disease and lower blood pressure.

Measures in place: The IPA provides support for the community through jobs, thus helping increase conservation effectiveness whilst simultaneously addressing social including financial issues within the community. In Warddeken, Indigenous rangers, funded by IAS, manage fire risks, invasive plants and feral animals, and monitor threatened species. In 2018/19 for instance, aerial culling of feral animals included 2,061 buffalo, 369 pigs and 81 cattle to preserve freshwater sites. Prescribed burning took place over 5,476 kilometres of mosaic fire lines. Perhaps even more importantly for the community, many lost sacred sites have been rediscovered.[85] Biological surveys have been carried out that led amongst other discoveries to the description of a hitherto unrecognised frog species.[86] During the same period, the IPA increased staffing levels from 50 to 131 (22 of which were permanent) – building to 4,208 person days per year, 58 per cent being from full-time staff. In total, the IPA employed 253 Indigenous people, with 47 per cent women.

Business case: Carbon offsetting has also been developed as a way of generating additional income. Between 2007 and 2021, Wardekken earned Aus$12.57 million from carbon sales. They have also become role models in the community, playing an important role in generating social cohesion and increasing collective esteem, which itself has many knock-on effects in terms of building a vibrant community.[87]

Lessons learned: Investment in jobs within IPAs has positive payback both in terms of rebuilding communities in remote areas and in reducing a range of social problems amongst people who otherwise have no job and few prospects. The broader conservation programme has been largely successful, showing for instance that aspects like collaborative monitoring of biodiversity is possible between local communities and outside specialists.[88]

Next steps: These initiatives need to be rolled out more widely and there is increasing discussion about extending the IPA concept into marine ecosystems as well.

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SDG 3: Good health and wellbeing

Summary for policy makers

Low environmental standards linked to air and water quality are common causes of death around the world. A large proportion of non-communicable diseases and related deaths are attributable to risks related to physical inactivity and obesity. At the same time, millions of people globally suffer from depression, including depression being a leading cause of disability.

- Access to nature and green spaces is known to have a significant role in supporting health and wellbeing, contributing to both physical and mental aspects of health. As such, effective area-based conservation can, and has in many cases already proven to, provide a valuable and cost-effective tool for reducing and managing health risks as part of local to national strategies.
- Protected and conserved areas can be used as tools to improve water and air quality and mitigate heat stress in urban areas.
- Area-based conservation plays a central role in encouraging and supporting physical activity and mental health, with protected area networks around the world providing easy access and infrastructure for recreation, sports and relaxation.
- Natural ecosystems protected by area-based conservation are significant sources of both local medicines and the raw materials for commercial pharmaceuticals.
- Intact and biodiverse ecosystems can slow the transmission of some vector-borne diseases and reduce the risks of zoonotic disease transmission from wildlife and livestock to people.

Building on the health benefits associated with nature, there is a case for authorities to integrate networks of conserved areas as part of overarching approaches to maintaining the health of citizens.

What is the challenge?

The contemporary global challenges to health and wellbeing are manifold, several directly linked to environmental parameters, and access to nature and green spaces.

Unsafe environmental standards: Poor air and water quality are common causes of death around the world. According to global statistics, air pollution increases the risk of cardiovascular and respiratory disease with an estimated annual death rate of around 7-8 million globally, with highest death rates occurring in Sub-Saharan Africa and Asia and Oceania.[1, 2] Around half of these deaths are due to air pollution outdoors, mainly caused by non-communicable diseases (NCDs) (see below).[3] Similarly, inadequate and unsafe drinking water, sanitation and hygiene is associated with 60 per cent of the disease burden from diarrhoea, 100 per cent from infections with soil-transmitted helminths and 16 per cent from protein-energy malnutrition, altogether leading to 870,000 deaths in 2016.[4]

Non-communicable diseases: According to WHO, 71 per cent of global mortality, about 41 million deaths per year, is due to non-communicable diseases.[5] A large proportion of these deaths are attributable to risks related to physical inactivity and obesity, diseases linked to outdoor and indoor air pollution (see above), and heat-related strokes and illnesses. According to the UN SDG progress report for 2019, the probability of dying from any of the four main non-communicable diseases (cardiovascular diseases, cancers, chronic respiratory diseases and diabetes) between the ages of 30 and 70 was 18 per cent in 2016.[6]

Mental health: Globally, more than 260 million people of all ages suffer from depression with WHO identifying depression as one of the leading causes of disability.[7] People with severe mental health conditions are known to die prematurely, even as much as two decades early, due to preventable physical conditions. In the worst case, depression can lead to suicide with – despite the global progress in curbing the trend – close to 800,000 people annually reported as dying due to suicide. Furthermore, suicide is identified as the second leading cause of death for the young (15-29-year-olds).[8]

Scarcity of medicines: A large proportion of the world's population still relies on medicinal plants collected from the wild, particularly in rural districts with poor access to healthcare but also in cities in many developing countries.[9] Many medicinal plants are now in short supply, others are subject to large-scale domestic and export markets. More generally, pharmaceutical companies are constantly searching for new drugs to manufacture and still rely to a large extent on genetic material sourced originally from the wild.

Risk of zoonosis: Finally, while the evidence of nature's health and wellbeing related benefits is clear, it also needs to be acknowledged that ecosystems, especially when degraded and fragmented (see following section), can also act as origins of zoonoses (i.e. diseases that can be transmitted from animals to people), with the 2019-2020 COVID-19 pandemic being the most recent reminder of this. Wildlife serve as the origin for over 70 per cent of all zoonotic diseases.[10] Wildlife, like humans, have thousands of naturally occurring microbes, most of which do not cause disease in either wildlife or humans, but a small number of diseases of wildlife "jump" to humans. Lack of immunity or resistance means that when this happens the results can be particularly serious.

Increased contact rates between humans and animals, either in the wild or through trading and eating wild animals, increases the probability of potential pathogens jumping from wildlife to livestock and humans (and in some circumstances, humans to wildlife). Some of these spillover events spread in epidemic or pandemic proportions, such as HIV, Ebola, SARS, MERS, avian flu and most recently COVID-19, etc. In nature, the ecological condition of an area may either buffer or facilitate pathogen shedding within reservoir host species as well as pathogen spreading between hosts. So, for example, unsustainable and frequently illegal levels or types of human actions within and around protected and other conserved areas that

disturb wildlife species and their ecology may lead to amplified pathogen shedding and contact spreading.[11]

Finally, the above challenges are generally underpinned by overall socio-economic wellbeing, with poverty being a major contributor to health and wellbeing related vulnerabilities around the world. For example, 76 per cent of suicides are found in low- and middle-income countries.[12]

SDG 3 aims to address the above challenges through multiple goals, a number of which can directly benefit from nature and area-based conservation. In particular, SDG 3 foresees by 2030 reducing premature mortality from non-communicable diseases by one third through prevention and treatment (Target 3.4). This includes explicitly cardiovascular disease, cancer, diabetes and chronic respiratory disease. Furthermore, it strives to promote mental health and wellbeing, including reducing suicide mortality rate. The goal is also to reduce child mortality (Target 3.2) and substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination across all age groups (Target 3.9). Finally, as a prerequisite to the above, the goal aims to strengthen the capacity of all countries, in particular developing countries, for early warning, risk reduction and management of national and global health risks (Target 3.D).

How can effective area-based conservation help?

Access to nature and green spaces is known to have a significant role in supporting health and wellbeing, supporting both physical and mental aspects of health. As such, conserved areas can, and in many cases have already proven to, provide a valuable and cost-effective tool for reducing and managing health risks as part of local to national strategies. The ways conserved areas support the delivery of SDG 3 are underpinned or interlinked with the delivery of several other SDGs, including in particular provisioning of food, clean water and sanitation (SDG 2 and SDG 6), guaranteeing the wellbeing of sustainable cities and communities (SDG 11) and supporting sustainable livelihoods to address poverty (SDG 1).

Improving water quality: Natural ecosystems play an important role in maintaining water supply and regulating water quality, thereby contributing to safeguarding human health.[13] As highlighted in the chapter on SDG 6, the quality of water flowing from natural forest catchments and wetlands – often protected under different area-based conservation schemes – is generally higher than water flowing through agricultural land, industrial areas or urban settlements.[14] This includes the ability of natural ecosystems to remove nutrient and chemical pollutants and also to reduce microbial contamination in water.[15] The removal of nutrients is of key importance, preventing eutrophication and increased frequency of algal blooms, several of which are toxic. In recognition of this, a variety of actors – from cities and municipalities to businesses – around the world use effective area-based conservation as a means to support safe water supply, reducing the need for artificial treatment.[16]

Improving air quality: Conserved areas within and in the vicinity of urban centres function as “clean air oases” for city inhabitants. This is because green spaces have markedly cleaner air than other urban areas. Furthermore, green spaces with tree cover are known to help to remove significant amounts of air pollution, with the amount of leaf area as one of the key characteristics supporting effective removal of airborne pollutants.[17,18] While any urban green infrastructure can support air quality, larger areas such as urban parks and protected areas around cities are able to offer this benefit at scale.

Reducing heat effects: Increased air temperature in urban areas can lead to increased heat-related stress and illness. Urban vegetation, particularly tree cover, cools the air through evaporation while simultaneously providing shade. Studies show that vegetated areas can cool the surroundings by several degrees, with higher tree and shrub cover resulting in cooler air temperatures.[19] Furthermore, pollutant emissions are often related to air temperatures and consequently

cooler temperatures can also help to lower emission of pollutants. Building on this knowledge, several cities use conserved areas as part of their strategy to manage the impact of heat waves on inhabitants. For example, the cities of Vitoria-Gasteiz in Spain and Zagreb in Croatia use their green infrastructure – including protected areas – as a strategy to manage the urban heat island effects in the area.[20, 21] The cooling effect of urban vegetation will become increasingly important as climate change causes average temperatures to rise and the incidence of heat waves to increase.

Improving access to both local and global medicines: More species of medicinal plants are harvested than any other natural product[22] and over a quarter of known plants have been used medicinally.[23] Many are now obtained from protected areas, having disappeared from the wider landscape, and collection is often subject to particular management agreements with local communities.[24]

Furthermore, medical drugs from natural products support an industry worth billions of dollars which unfortunately often does not return to conservation. One of the most famous examples of beneficial microorganisms collected from national parks is the thermophile *Thermus aquaticus*, collected from a hot spring at Yellowstone National Park in 1966, it helped in the development of the Polymerase Chain Reaction process widely used in medicinal applications.[25] As natural ecosystems come under pressure, the importance of protected areas as sites where researchers can find new genetic material is being recognised. In some cases, this is helping to pay for protected area establishment and management, for instance in Costa Rica where local and international pharmaceutical companies have paid royalties to the protected area system.[26] Forests[27] and oceans[28] are important sources, with both plants[29] and animals[30] serving as sources for commercially produced medicines. A significant number come from studying Indigenous peoples' medicines,[31] and there is an important role for local control of resources and local land tenure in ensuring sustainable collection of medicinal plants, perhaps within OECMs.

Improving physical and mental health: The role of nature and green spaces in encouraging and supporting physical activity is universally acknowledged. This is known to reduce various risks linked to inactive lifestyles such as obesity, cardiovascular diseases and type 2 diabetes.[32] For example, the Lake Hévíz protection area in Hungary protects Lake Hévíz, a waterbody known for its sulphur content and related curative effects and used by the local rheumatism hospital to help to treat its patients.[33] In addition to benefits to physical health, nature and green spaces are also increasingly recognised as vital for relaxation and emotional wellbeing.[34]

Mental wellbeing benefits linked to nature include improved attention, cognition, sleep and stress recovery, with all these benefits applying across all demographic and socio-economic sectors of population.[35] The mental health related benefits provided by protected areas have been estimated as US$6 trillion per year globally, exceeding the global value of protected area tourism.[36] Recognising these benefits, authorities in several countries including Australia, Canada, Finland and Scotland have taken the decision to recognise green spaces – and the network of conserved areas in particular – as part of the country's overarching approach to maintaining the health of their citizens.[37]

A global study looking at the wellbeing benefits associated with protected areas in over 30 developing countries found out that welfare and, in particular, the health of children were positively impacted by the vicinity of protected areas.[38] This was concluded to be associated with households near protected areas having higher wealth levels (e.g. due to tourism) and a lower likelihood of poverty – by 17 per cent and 16 per cent, respectively – than similar households situated away from protected areas, with positive knock-on effects on child health and development. According to the study, children under five years old living near protected areas with tourism had higher height-for-age scores (by 10 per cent) and were less likely to be stunted (by 13 per cent) than similar children living far from protected areas.

While all green spaces can be a source for physical and mental benefits, protected and conserved areas have a number of characteristics that explicitly support this. Firstly, protected areas commonly have infrastructure and services in place that both encourage and facilitate visitation, including a network of trails, and information, accommodation and catering services. Infrastructure and services are often also the determining factors for tourism and related revenue that can yield positive impacts on the local health levels as shown above. Secondly, some studies also point to areas with higher biodiversity providing greater restorative benefits across different age, gender or ethnic groups.[39]

Ecosystem management to mitigate health risks: There is abundant evidence that zoonotic occurrences cannot be viewed in isolation from the human activity that alters natural ecosystems. For example, outbreaks of schistosomiasis – a waterborne disease caused by parasitic worms – are known to be associated with unsustainable use and degradation of ecosystems, with activities such as overfishing, deforestation and alteration of water courses leading to an increase in the parasite's host populations and related increase in the risk of contracting the disease in countries such as Malawi, Cameroon, Kenya and Egypt.[40]

Consequently, protecting the integrity of natural ecosystems through effective area-based conservation can also be seen as a tool to help to reduce the risk of zoonosis in the future.[41] In particular, protecting remaining natural habitats, such as primary forests, can help to reduce the chances of zoonotic disease transmission by preventing the displacement of species and thereby decreasing their contact with people.[42] For example, avoiding deforestation can reduce risk of malaria and certain other vector-spread diseases.[43] In Indonesia, Ruteng Park on Flores protects the most intact submontane and montane forests on the island. Communities living nearby were found to have fewer cases of malaria and dysentery than communities without intact forests.[44] Furthermore, research has shown that fragmented habitats may stimulate more rapid evolutionary processes and diversification of diseases.[45] By safeguarding ecosystem integrity and species diversity, protected and conserved areas can help to bring back stability to natural environments, in this way helping to prevent outbreaks of pathogens.

Approaches that support SDG 3

Almost all types of effective area-based conservation can provide opportunities for supporting health and wellbeing and the delivery of SDG 3. However, some areas are particularly suited for this purpose. As nature's health related impacts are commonly associated with close vicinity to human populations, including easy everyday access to use green areas for exercise, the types of protected and conserved areas most relevant to SDG 3 tend to be those linked to human settlements, in particular in the urban context.

Protected areas

- **Urban nature reserves:** Urban nature reserves provide easy access to green areas and support the delivery of SDG 3 goals ranging from increased air quality and reduced heat stress to physical and mental health. Inevitably, the conservation objective in these cases is less on protecting intact and highly biodiverse ecosystems and more on maintaining or restoring semi-natural areas that provide both some biodiversity conservation and space for people.
- **Protected areas established adjacent to / near cities and other communities**: Urban centres around the world – from Nairobi to Helsinki and Cape Town to Paris – have protected areas nearby, with considerable benefits to the health and wellbeing of urban inhabitants. As in the case of urban parks, these benefits are related to both improving the quality of environmental parameters (air, temperature and also water) and providing opportunities for exercise and relaxation that benefit physical and mental health. One of the key roles performed by this type of area-based conservation is the maintenance of water quality (see SDG 6 for further examples).

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- **Protected areas supporting community health and medicines**: Health and wellbeing benefits associated with protected and conserved areas are not limited to urban centres but apply to smaller communities as well. Such self-governed areas can supply many different kinds of health benefits to their residents, from medicinal plants to clean water supplies, spiritual values and good nutrition, supporting both physical and mental health.
- **Protected areas supplying raw materials to pharmaceutical companies**: A small number of companies have set up commercial licensing deals with protected areas to pay for access to genetic resources for research into new medical drugs. More generally, the pharmaceutical industry continues to rely on the existence of species secured in protected and conserved areas as a resource for medical research.

OECMs

- **Urban green areas with significant biodiversity values**: Urban centres also contain green spaces of varying naturalness, including for example different private and public parks, and botanical gardens where these contain natural areas, and areas protecting watersheds. Those with extensive areas of natural ecosystems and significant biodiversity may also be OECMs. Examples include Hampstead Heath in London and Kirstenbosch Botanical Garden in Cape Town. These areas are important for many of the health-related benefits and are increasingly also managed for wider biodiversity values (e.g. species diversity), in this way also often increasing the enjoyment of users. The IUCN guidance on OECMs recognises: "*Urban or municipal parks managed primarily for public recreation but which are large enough and sufficiently natural to also effectively achieve the in-situ conservation of biodiversity (e.g. wild grassland, wetlands) and which are managed to maintain these biodiversity values.*"[46]

Key complementary approaches

These may be applied in protected areas, or OECMs, or in other effective area-based strategies:

- **Corridors**: Many urban areas retain habitat corridors along rivers, streams, coastline, mangroves and rocky outcrops. These corridors are important for a range of wildlife and support the environmental quality of the city while simultaneously making the urban environment more appealing for physical exercise. Designing urban corridors to be also used as pedestrian or cycling pathways increases their contribution to both physical and mental health.

Promotion of national health benefits as a part of protected area governance

The network of national, provincial and territorial parks, Canada

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Co-benefit SDGs

Dawn Carr (Canadian Parks Council), **Mike Wong** (World Commission on Protected Areas – North America), **Pascale van der Leest** (Parks Canada), **Anne Craig** (Ontario Parks), **Catherine Grenier** (Sépaq), **Karine Ménard** (Sépaq).

Introduction

The Canadian Parks Council (CPC)[47] is an intergovernmental leadership forum of national, provincial and territorial park organisations. Since 1962, the heads of Canada's park agencies have served as CPC board members and together they represent the interests of 14 governments, over 2,700 parks, and a shared mandate to enhance the environmental, social and economic values of parks throughout Canada. Each park agency within the CPC network contributes significantly to the health and wellbeing of Canadians and the millions of visitors who experience the powerful benefits of nature. Nurturing and establishing partnerships to help Canada's park systems increase their contributions to the physical and mental health of Canadians is a strategic priority for the CPC. In fact, in 2018 all federal, provincial and territorial park ministers responsible for parks endorsed a vision for "connected Canadian park lands and waters that support healthy nature and healthy people in harmony for generations" in a pan-Canadian Action Plan called *Parks for All*.[48, 49] This collaborative plan produced by representatives in all levels of government (Indigenous, federal, municipal, provincial and territorial) and allied sectors includes direct actions to advance the interconnectivity between health and nature.

At present, Canadians spend more time indoors than at any other point in history – 90 per cent of each day, with 69 per cent of waking time sitting. This indoors, sedentary life that is disconnected from nature comes with significant costs. In Canada, the total spending on health has grown from 7 per cent of Gross Domestic Product (GDP) in 1975 to 11 per cent in 2016. This amounts to a staggering 226 billion CAD or over 6,000 CAD per person (around US$170 billion and US$4,480, respectively). This is due in part to an aging population, but the increase in chronic disease plays a major role. The rate of chronic disease in Canada is rising by 14 per cent per year and our lifestyle choices are driving this epidemic—inactivity and poor eating choices leading to obesity, the major cause of chronic disease. This comes with a big price tag given the treatment of chronic disease consumes 67 per cent of all direct healthcare costs.[50]

Anxiety and mood disorders are also on the rise; 12 per cent of adult Canadians have a diagnosed anxiety or mood disorder. Along with mental health challenges come stigma, social isolation and lost productivity. Evidence is emerging that connecting with nature can be both preventative and restorative for mood disorders, as humans need exposure to green space for optimal cognitive function. Indeed, it has been documented that when Indigenous communities lost their connection to the land from displacement, particularly in the early establishment and later management of Canadian protected areas, their interconnectedness with the land was disrupted causing harm to their health, wellbeing and sustainable way of life.[51]

The most important cause for action is to reverse the current health trend that shows Canadian children may not live as long as their parents. Only 9 per cent of Canadian kids aged 5 to 17 get the 60 minutes of heart-pumping activity they need each day. Seventy-six per cent are getting more daily screen time than what is recommended. Play, and play outside in nature in particular, have been identified as a key solution to this health challenge.[52]

Canadian Park Sector Actions to Enhance Health and Wellbeing

- **Enhance** initiatives and partnerships with the health sector taking into account that Nature has a positive impact on mental and physical health.
- **Support** efforts that connect Canadians with Nature to garner long-term public support for conservation including sharing knowledge about how Nature can bolster individual and community health and wellbeing.
- **Champion** the economic, social, cultural and environmental benefits provided by healthy ecosystems. Ensure these are accounted for in decision-making as contributing to stronger economies.
- **Nurture** healthy and positive communities through connections to land and water, and help to share their stories widely.
- **Continue forging** research partnerships with universities and other knowledge institutions.
- **Parks for all** provides a framework that encourages parks at all levels to strengthen relationships with Indigenous people, leading to actions built on the basic and effective principles of reciprocity: gratitude, respect and generosity – all of which contribute to our collective health and wellbeing.

The following examples showcase how three member agencies of the CPC are actively working to promote the health benefits of parks in uniquely different ways.

Parks Canada Agency: National Parks fostering connections between health and culture

The parks and protected areas within Canada's system of national parks conserve biological diversity, while representing cultural and spiritual significance that deeply influence the health and wellbeing of communities, notably Indigenous communities from coast to coast. In the current era of reconciliation and relationship building, partnerships that more fully recognise the longstanding and ongoing contributions of First Nations, Inuit and Métis in conserving the country's lands and waters are being established and the results are uplifting and important. Two recent initiatives underscore the nature–culture connection and how they contribute to health and wellbeing.

The Return of Bison to Banff National Park: In 2017, 16 bison were reintroduced to Banff National Park, more than 100 years after the species' borderline extinction.[53] Today the bison now number 36 and are roaming free in a 1,200 km² reintroduction zone – the herd population is expected to surpass 300 by 2031. Bison are a keystone species and play a huge role in the maintenance of the ecological integrity of the ecosystem. They are also a vital part of the lives of Indigenous people and restoring bison to the landscape has been an important opportunity to renew cultural and historical connections. The Bison reintroduction

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programme is restoring and renewing the health and wellbeing of the ecosystem and the communities who live interconnectedly in Canada's first national park.

Thaidene Nëné National Park Reserve: Thaidene Nëné is the homeland of the people whose ancestors here laid down the sacred, ethical and practical foundations of their way of life. Located in the Northwest Territories, Thaidene Nëné National Park Reserve is a culturally rich area, where Indigenous traditions and harvesting are practised.[54] It also hosts spiritual areas used by Indigenous people for generations. The establishment of Thaidene Nëné in 2019 protects the rights of Indigenous people to live their way of life on the land which is essential to their health and wellbeing. The cooperative management arrangement also acknowledges the critical role of Indigenous-led conservation practices and knowledge that support the long-term sustainability of the region.

Ontario Parks – A Canadian leader in Healthy Parks Healthy People

Ontario Parks has been actively promoting the links between health and nature since 2013, creating an opportunity for the organisation to be a leader of the IUCN's Healthy Parks Healthy People (HPHP) initiative in Canada.[55] Ontario Parks' commitment to health is entrenched in its *Strategic Direction: 2017 Forward*. The direction includes health as one of six core values of the organisation: "We believe there is a critical link between the health of parks and human health, and we will sustain and enhance this connection."

In the initial years of the HPHP initiative, Ontario Parks focused on a series of special events that challenged visitors and local citizens to get outside and that engaged health and community partners. These include an annual HPHP Celebration Day on the third Friday in July, a 30x30 Challenge in August, challenging Ontarians to spend 30 minutes a day in nature for 30 consecutive dates, and First Day Hikes on New Year's Day.

Ontario Parks is now entering the next phase of the HPHP programme. In 2019, the Ontario government conducted a large-scale public consultation seeking input on how to advance the role of green space in health and wellbeing. Health professionals, researchers, educators, environmental organisations and the general public were invited to provide input. Responses were positive and constructive. There was overwhelming support for the role of parks in providing health benefits. Ontario Parks will be developing a strategic plan for Healthy Parks Healthy People from the wealth of data collected during this process.

Case study

Sépaq – Quebec's Park Agency's linkage between health and nature

In order to deepen knowledge about the social benefits of the natural areas it manages, the Société des établissements du Québec (Sépaq) commissioned a study in 2019. One of the components covered focused on the impacts of natural areas on overall health, a subject that has been little documented so far in the province of Quebec.

The study has discovered that visitors who attend Sépaq sites several times a year visit health establishments less, feel less pain and take less medication. Furthermore, after visiting a Sépaq site, 87 per cent of participants feel calm and peaceful, while 85 per cent say they are happier and more positive.

These results corroborate international scientific studies which reveal in particular that time spent in nature decreases stress, strengthens the immune system, promotes concentration and encourages social interactions.

Being the largest outdoor network in Quebec and managing vast public territories, Sépaq wanted to be associated with projects related to the health benefits of nature, and more specifically with the intervention by the nature sector.

Reconnecting with nature can play a significant part in a rehabilitation process. Sépaq has established a new partnership this year with Le Grand Chemin, a centre where teenagers from 12 to 17 years old are being treated for drug addiction, alcoholism, pathological gambling or cyber addiction, to offer a novelty in their therapy programme: outdoor and adventure therapy. In the form of a forest expedition of three to five days in one of Sépaq's national parks, social workers accompany a group of young people to live a meaningful experience with great healing and transformative potential and to push themselves beyond their mental and physical limits. The context of nature being soothing for young people, this addition to the intervention programme increases their motivation by providing a context that goes beyond the paths of traditional therapy. When they return, the participants share a great feeling of pride and accomplishment.

For a third consecutive year, Sépaq also continues to work with the province's Education Ministry to get young people moving on a daily basis. In 2019, more than 18,600 primary school students visited a Québec national park where they were welcomed into a day full of healthy outdoor activity and enjoyment.

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Protected areas as a source of health for all

The network of protected areas, State of Victoria, Australia

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Co-benefit SDGs

Tony Varcoe, **Shauna Jones**, **John Kenwright** and **Jo Hopkins**, (Parks Victoria).

Park visitors on an all abilities walk at Yarra Bend Park

Background

Parks Victoria manages 18 per cent of the State of Victoria's land mass (4.3 Mha), and manages this estate in partnership with Traditional Owners, government and non-government organisations and the broader community. The estate Parks Victoria manages includes national and state parks, wilderness areas, and regional, metropolitan and marine parks, and it attracts a broad diverse range of visitors that include visitors of all abilities and ages.[56]

Created in 2000, Parks Victoria developed the "Healthy Parks Healthy People" (HPHP) initiative to recognise the importance of contact with nature as essential for human emotional, physical and spiritual health and wellbeing that also reinforces the crucial role that parks and protected areas play in nurturing healthy ecosystems. The Healthy Parks Healthy People approach informs Parks Victoria's approach to the management of Victoria's national, state and regional parks and reserves, and waterways, piers and marine parks #healthyparkshealthypeople.

The Healthy Parks Healthy People initiative has spread to places as diverse as Europe, the United States, Korea, Finland, Canada, Colombia, the United Kingdom and New Zealand. While different countries and states are at different stages of implementation, a common HPHP approach is being developed. It reinforces the need for stronger partnerships between the environment, health and community sectors in creating integrated policies, communications, research and on-ground programme partnerships.

The Victorian Memorandum for Health and Nature

The Victorian Memorandum for Health and Nature (the Memorandum)[57] was launched at the 15th World Congress on Public Health, Melbourne, April 2017. The Memorandum, signed by both The Hon Lily D'Ambrosio, Minister for Energy, Environment and Climate Change and the then Hon Jill Hennessy, Minister for Health, recognises that there is a strong connection between the health of the natural environment and human health and wellbeing – and that there are diverse benefits for all Victorians from being in the outdoors including physical, psychological, cultural and social health and wellbeing.

The Memorandum provides a platform to support and enable an integrated, whole of

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Children playing in the all abilities playscape at Brimbank Park

government approach that recognises the benefits of healthy parks and other natural assets for the health and wellbeing of all Victorians. Central to the intent of The Memorandum is to "...ensure that we can maximise the physical and mental health benefits to all Victorians of spending time in, enjoying and actively caring for the environment."

To implement the Memorandum, a cross-government Working Group was established to identify and coordinate opportunities to promote whole of government responses, shared communications and engagement strategies relating to health and nature. The Working Group consists of core members, the Victorian Departments of Environment, Land, Water and Planning (DELWP), Department of Health and Human Services, and Sport and Recreation Victoria and Parks Victoria (PV), with other agencies, including the Environment Protection Agency, Department of Education and Training (DET), the Victorian Health Promotion Foundation (VicHealth) and Local Governments represented by Municipal Association of Victoria (MAV) invited to participate in Working Group meetings as required.

Examples of the organisational and collective achievements and work-in-progress under the Memorandum are identified below.[58]

Integrated policy: A key objective of the integrated policy approach is in cross-referencing between public health and biodiversity conservation policy that seeks to enshrine intersectoral policy collaboration as "business as usual". It includes a focus on implementing common goals of the Victorian Public Health and Wellbeing Plan and the State Biodiversity Strategy 2037, including "Victorians Value Nature" goal and "Nature is Good Medicine" objectives. It also includes influencing the update of the Victorian Public Health and Wellbeing Plan 2019-2023 – priorities include Climate Change and Health, Active Living and Healthy Eating and settings include parks, nature and public open space and enabling cross-sector implementation of the new Parks Victoria "Healthy Parks Healthy People" Framework by 2020.

Advocacy and leadership: A number of common focus projects are supported between represented government organisations and sectors within the MOU, such as enabling cross-sector promotion of walking (as a subset of State-wide priority area Active Living), including growing *walking in nature* opportunities. The establishment of the Victorian Active Living Alliance (VALA) 2019 initiative is led by the Department of Health and Human Services and Sport and Recreation Victoria, it provides a coordinating and collaborating platform for state-wide and local community organisations working towards a common goal of increasing the opportunities for community members to become and stay physically active. Active membership includes hundreds of organisations across Victoria.

Collaboration and funding opportunities: Finding opportunities are in place for improved integration of new policy platforms, programmes and strategies. For this purpose, Parks Victoria has established partnerships with a number of relevant organisations including, for example, YMCA Camping, headspace Youth Mental Health services, Australia Refugee and Migrant Education and Settlement Service (AMES) and Dementia Australia (Victoria) and WorkSafe Victoria.

One of the key initiatives supporting the establishment of such opportunities was

convening an inaugural Nature Is Good Medicine Summit 2018, led by Parks Victoria. The summit attracted over one hundred people from eighty health and non-health organisations and services, universities and research entities, inviting cross collaboration on joined-up health and nature initiatives, and has resulted in a range of collaborations between attendees and organisations at the summit.

Sharing information and priorities of previous and existing initiatives is also a key for furthering collaboration, including initiatives such as the Victorian Government's Victoria's Great Outdoors (VGO) initiative 2019-2023 and the Suburban Parks project, to encourage people to take recreation outdoors and connect to nature. Parks Victoria has developed a new VGO Volunteering Innovation Fund that commenced in July 2020. Efforts are also made to promote nature-related health initiatives and campaigns such as Active Victoria events, Seniors Week events and Victorian Nature Festival September 2020.

Finally, a key focus is also to leverage funding to support health professionals to 'socially prescribe nature' including capacity building and training tools for volunteers and sector development to deliver on the various health and nature initiatives.

Opportunities and challenges:

Influencing health and wellbeing goals through protected areas and other green spaces covers many aspects of government and non-government policy and practice; from urban and regional planning to provision of park settings and services, to education policy and programmes and to climate change and health promotion. In implementing the Victorian Memorandum for Health and Nature, Parks Victoria has initially sought to focus on sharing information across government and creating realistic and achievable cross-sector opportunities that can be scaled up over time.

Likewise, the cross-government Working Group (WG) has initially been a relatively small and focused group looking to identify short to medium-term collaboration opportunities. Organisational membership from the participating government departments has, in large part, remained consistent, but has also seen a step back from one organisation and a step forward by one or two others as focus areas of the group evolve. Additionally, many of the original representatives from each organisation have continued while also regularly inviting additional personnel to join the WG. The structure of the WG is flexible enough to accommodate these permeable boundaries around the membership. The WG has used the opportunity to include a range of other relevant stakeholders that can represent complementary agendas and policy directions.

The annual review of the partnership status has been relatively informal but has allowed the WG to also consider whether it currently has the "right people and organisations" around the table; to question whether its Terms of Reference still reflect the original intentions of The Memorandum, current government policy and strategic directions, and to undertake a review and stocktake of its common achievements.

The future and sustainability of The Memorandum for Health and Nature is flexible and adaptable to the machinery of government changes, changing and emerging high-level policies and strategic directions, and personnel and as such could survive successive iterations of itself. It is dependent upon planned actions being evidence-based and informed, collaboration across multiple sectors and stakeholders, and it being embedded in the "business as usual" model of those organisations leading an integrated action approach to ensuring sustainable environments and ecosystems and communities that are supportive of human and environmental health and wellbeing.

Access for all initiative by Parks Victoria

One in five of the population in Victoria live with a disability, and they experience a wide range of impairments and impacts on their everyday lives. Their disability may be present from birth or occur at some stage during their lifetime.

The health status of people with disabilities is poorer than that of the general population in ways that are not always directly related

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to their disability. Discrimination and lack of inclusion have a negative impact on their health. Contending with barriers, discrimination and negative attitudes contributes to anxiety, stress and ill health.

Over recent years, Parks Victoria has engaged with the disability community and relevant community organisations to better understand the barriers to park visitation and participation commonly experienced by visitors with disability. Some of the barriers identified during the community engagement were already known by Parks Victoria, and some barriers were newly identified.

The recommendations from this community engagement included:[59]

- More park access information was required, and the information needed to be more comprehensive to help visitors plan their park visit.
- There was a need for more visitor facilities, amenities and walking trails to be universally designed.
- Some visitors required physical/personal assistance to visit and explore parks.
- Some visitors with mobility issues required recreation mobility equipment to explore parks and could not afford this equipment (e.g. all terrain wheelchairs, beach wheelchairs).
- Online park resources were needed for visitors with autism to help them prepare for their park visit.

As a result of the community engagement, and through partnering with disability and community organisations, a range of programme initiatives have been undertaken by Parks Victoria to eliminate or minimise the barriers identified.

All terrain wheelchairs programme: Park Victoria has introduced all terrain TrailRider wheelchairs, which visitors can borrow for free in selected parks. Visitors, with the assistance of their friends/family members can explore more rugged walking trails in nature not accessible by visitors in conventional wheelchairs. As a direct result of visitor feedback, the chairs have been customised with electric motors to make it easier for the visitors and the chair operators to explore longer and steeper trails. A volunteer programme has also been established in selected parks to provide trained volunteers to assist visitors in operating the chairs on the many walking trails. A TrailRider trail assessment manual was developed to assist park rangers to identify suitable trails in parks for use of this equipment and assess their level of difficulty for chair users. TrailRider advisory signs and trail information were also developed for visitors to plan their trek using the TrailRider chairs.

Guided sensory walks: Parks Victoria, in partnership with community organisation Blind Sports & Recreation Victoria, co-designed a bush walking programme for visitors who were blind or vision impaired. These guided walks provide one-to-one assistance to participants, through the provision of trained volunteers. The volunteers assist participants with trail orientation, describing the natural environment around them, reading trail interpretive signage and providing opportunities for participants to connect with nature using their other senses such as touch, hearing and taste. The programme also provides opportunities for social interaction around a common interest and led to the formation of many new and long-lasting friendships between participants and volunteers.

Resources linked to autism: With the professional assistance of Amaze autism services, Parks Victoria has developed online park resources for parents, carers and teachers who have young children with autism. These resources, called social scripts, are designed to help prepare children for their park visit, helping them feel less overwhelmed and stressed when visiting a park for the first time. Through the provision of simple text and park images, the scripts allow parents, carers and teachers to rehearse in advance with the child what they may see, hear, touch and smell while in the park. Parents, carers and teachers can download these scripts from the Parks Victoria website, and adapt these resources according to the child's needs and their planned activities in the park.

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A park visitor using a Parks Victoria TrailRider™ all-terrain wheelchair and being assisted by Parks Victoria TrailRider™ volunteers at Dandenong Ranges National park

These three project initiatives are just some examples of the work Parks Victoria has undertaken to help create more accessible and inclusive parks for people with disabilities. Other examples include all abilities accommodation, all abilities fishing platforms and boating access and partnership programmes for all abilities camping. They have assisted visitors to access and enjoy parks and to gain the many health and social inclusion benefits of spending time in nature. This work has been recognised nationally through winning numerous specialist tourism awards.

Opportunities and challenges: Due to the success of the project initiatives and Parks Victoria's willingness to engage with the community, there has been growing interest from community organisations to work with Parks Victoria.[60] These community partnerships have led to increased innovative practice and enabled more people with disabilities to visit parks and gain the many health benefits.

The work undertaken aligns with State and Federal government policy directions of creating equity of access, increasing public and community health, social inclusion and changing negative societal attitudes towards people with disabilities. In doing so, it has created greater access to new preventative health and other funding grants, supporting more accessible and inclusive parks.

In addition to meeting equity goals, accessible tourism is a multi-billion-dollar global industry. The work undertaken to make Victoria's parks accessible for all has contributed significantly to creating accessible tourism destinations in parks, a growing market both in Australia and internationally. Regional tourism operators are now seeing the many benefits and opportunities of creating accessible opportunities in parks.

Making parks more inclusive for all visitors does pose some challenges including how to decide which visitor groups should be the focus, which organisations we should strategically partner, and sourcing the necessary resources to implement, evaluate and expand successful pilot initiatives.

Parks Victoria's goal is that over time, implementation of universal access principles will be "business as usual" in which accessibility and inclusion in parks will be integrated into park management, to ensure all communities have equitable access to the natural environment and to its many health benefits.

Information linked to this case study can also be found through the PANORAMA initiative.

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SDG 10 and SDG 5: Reduced inequalities, including improving gender equality

Summary for policy makers

There are massive global, national and regional inequalities related to age, sex, disability, race, ethnicity, origin, religion or economic or other status. People living in remote rural areas are often particularly disadvantaged. The ways in which protected areas and OECMs are governed and managed offer a number of important opportunities to contribute to reducing social and economic inequalities, particularly through:

- Actively promoting social inclusion, particularly relating to ethnic or religious minorities, women and youth, in planning and managing effective area-based conservation initiatives
- Ensuring equal opportunities in employment directly within a protected area or OECM, or through support of associated businesses
- Making sure that access to wider benefits, such as the full range of ecosystem services and any economic benefits from tourism related to protected areas, preferentially benefit the disadvantaged in society

These benefits will not occur automatically – many inequalities are deeply embedded within societies – and will require thoughtful and sometimes gradual interventions over a long period of time. Some protected area approaches, especially but not only those related to cultural landscapes and seascapes, and extractive reserves, are particularly well designed for supporting such efforts.

What is the challenge?

We live in an unequal world, where differences in where someone is born, their skin colour, ethnicity, gender, sexual orientation and underlying health all have a huge influence on their life opportunities. While some inequalities are narrowing, others are still getting worse. In 2018 for instance, the richest 26 people in the world owned the same as the poorest half of humanity, yet billionaires are paying less in tax than they have for decades[1] and the gap between the richest and poorest is widening.[2]

Ethnicity has an enormous influence on life chances, with white people almost everywhere being at a dramatic advantage in terms of education, employment, home ownership and health.[3] This has direct economic impacts: in the United States the median white family has 41 times more wealth than the median black family and 22 times more wealth than the median Latino family, and, again, these differences have increased over the last few years.[4] People recognised as Indigenous or from ethnic minorities are almost everywhere at a disadvantage.

There is also huge inequality in health and the risks of early death. Societies with more inequality appear to be less healthy.[5] A child born in one of the countries with the worst health is 60-times more likely to die than a child born in a country with the best health.[6] In 2019, the country with the lowest life expectancy was the Central African Republic with 53 years, in Japan life expectancy was 30 years longer.[7]

There are stark contrasts between city and country. Before 1800, less than 2.5 per cent of people lived in cities, by 1900 it was 10 per cent,[8] in 1964 two-thirds of people were still rural,[9] but by 2007 the balance tipped, with more people living in urban areas.[10] By 2014, urbanisation was above 80 per cent in Latin America, the Caribbean and North America; 73 per cent in Europe, 48 per cent in Asia and 40 per cent in Africa.[11] Singapore is 100 per cent urbanised, Japan 93.5 per cent, and Israel 92.1 per cent;[12] and 200,000 people migrate to cities every day.[13] Income gaps between rural and urban dwellers are a major incentive,[14] along with a desire to increase quality of life,[15] improve educational opportunities,[16] and avoid climate change[17] and weather-related disasters.[18] Of relevance here are the dramatic differences in life chances between urban and rural dwellers. In countries like the United States[19] and China[20] this gap is currently widening, although studies in countries like India, Vietnam and Thailand also find the rural–urban income gap narrowing over time.[21]

Gender inequality remains endemic, despite welcome signs that it is declining in many countries.[22] Progress is uneven; there have been improvements in education opportunities for women and also, but more unevenly, in employment, although global stress in labour markets has reduced men's access to employment, increasing the risk of gender conflict.[23] Violence against women is increasing in many countries,[24] including against politically active women.[25] Women whose rights are facilitated by husbands, brothers or fathers can lose property or tenure rights following migration, widowhood, divorce or desertion.[26]

By the nature of their roles, women in rural areas are particularly impacted by degradation of natural resources and climate change. Particularly in the developing countries, women's traditional roles usually include collection and preparation of fuelwood,[27] water,[28] fodder, medicinal herbs, fruits and seeds.[29] They are thus reliant on healthy ecosystems; forest degradation reduces fuelwood availability, for instance, with the time required for collection in the Himalayas having increased by an average of 60 per cent in the last quarter century.[30] The "invisibility" of much of the work women do means that these environmental losses are often unrecognised or ignored. If household land becomes degraded, women often need to find ways to supplement declining food production such as selling their labour or petty trading.[31] Women in parts of Kenya can use 85 per cent of their daily calorie intake just fetching water.[32] Women are mainly responsible for fuelwood collection in dry tropical forests except where there are constraints such as *purdah*,[33] and forest loss increases their work: the time needed for firewood collection in the Himalayas has

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increased by around 60 per cent in 25 years because of the declining forests.[34]

Gender issues are particularly stark in relation to land ownership and management. Many women in developing countries have no ownership or tenure rights over land or natural resources, or lose rights after widowhood, divorce or desertion.[35] Yet conversely, as more men migrate in search of work, women are left as the responsible head of households,[36] tending livestock[37] and engaging in commercial activities, in addition to childcare and domestic tasks.[38] The proportion of women farmers is gradually increasing in many places, with associated changes in the way that agriculture is practised and in how women's farming roles are perceived.[39] Women are often disproportionately vulnerable to climate change, including rural women in developing countries who are dependent on natural resources.[40]

SDGs 10 and 5 aim to address the above inequalities, many of which are rooted in deep-seated cultural differences, some of which have been in place for millennia. Many of the sub-goals and indicators under these SDGs are outside the scope of protected and conserved areas, including dealing with fiscal policies of governments, regulation of global financial markets, well-managed migration policies and development budgets. But there are three sub-goals for SDG 10 that have more grassroots societal implications, building on opportunities provided by well-functioning ecosystems and synergies with governance structures linked to area-based conservation. Target 10.1 aims to "*progressively achieve and sustain income growth of the bottom 40 per cent of the population at a rate higher than the national average*". Target 10.2 is to "*empower and promote the social, economic and political inclusion of all, irrespective of age, sex, disability, race, ethnicity, origin, religion or economic or other status*". Target 10.3 has a broad objective to "*Ensure equal opportunity and reduce inequalities of outcome…*", with an emphasis on changing laws, which are generally outside our purview, but also on promoting supportive policies. None of these issues are central to the aims of

protected areas or OECMs, but all can be addressed through the way that they are approached and managed (and failure to take account of these issues may also cause management to fail in turn).

As for SDG 5, while all its targets could and should be addressed within the remit of effective area-based conservation, two targets stand out. Target 5.1 aims more generally to end all forms of discrimination and Target 5.5 encourages full and effective participation and equal opportunities for leadership at all levels. Making sure that personnel policies related, for instance, to staff hiring, particularly at senior level, are gender sensitive, and ensuring that women are well represented in consultation processes, management planning, equitable benefit sharing and monitoring can all help address inequalities.

How can effective area-based conservation help?

Protected and conserved areas can help to address issues of inequality in three main ways. First, by ensuring that all voices are heard, and listened to, in **participatory approaches** to planning and managing a protected area or OECM, including those social groups that are often left out of such processes. Second, by providing direct **employment** or support for local businesses that spread benefits to everyone rather than to a few. And third, by making sure that **access to wider benefits**, including a full range of ecosystem services, preferentially benefit the disadvantaged in society.

All these things are easy to say, but often hard to achieve in practice. An individual protected area manager will often find it hard to address underlying social inequalities. Community-run initiatives may favour the status quo,[41] benefitting the majority but leaving ethnic or religious minorities at a disadvantage.

Participatory approaches: Giving people a voice is a critical step in addressing basic inequalities. Many governments are reluctant to provide citizens with too many opportunities to interact with officials to make their opinions known or even play an active role in management decisions. Protected areas can provide a relatively neutral ground on which to try out such participatory approaches. Existing issues, such as access to natural resources, addressing human–wildlife conflict and managing visitors can provide a focus for such discussions, although ideally interaction should take place at planning stage.

Participation in protected area management can range from consultation to a full transfer of power to local stakeholders or recognition of different governance and management regimes, with some of the stages outlined in the figure 10/5.1.[42] The concept of sharing power in natural resource management has been increasingly recognised[43] and a variety of tools developed on identifying stakeholders, ensuring that no-one gets left out, and ways in which to ensure meaningful participation in planning and management.[44] Requirements such as Free Prior and Informed Consent for Indigenous people[45] have brought a measure of legislative power behind voluntary actions. IUCN's recognition of multiple governance types in protected areas,[46] and initiatives such as the ICCA Consortium,[47] help to increase the opportunities for protected and conserved areas to play a positive role in building inclusivity into conservation messages.

The need for ecosystem management to involve women is increasingly recognised.[48] Protected areas and other similar initiatives have a number of clear opportunities to be mindful of, and supportive of, moves towards gender equality. Protected areas are often in remote areas, where deep-rooted traditions exist and where sensitive employment opportunities and approaches to stakeholder involvement can drive positive change. Protected areas and associated NGOs can also help local communities reduce gender-based violence through local empowerment programmes, and avoid inadvertently creating new causes of gender-based violence.[49]

OECMs offer both new opportunities and some new challenges in that very different stakeholders will be involved in their governance and management. Efforts will sometimes be needed to strengthen governance and avoid reinforcing gender

Figure 10/5.1: Participation in management of protected areas and OECMs: a continuum

Full control by the agency in charge		Shared control by the agency in charge and other stakeholders				Full control by other stakeholders
COLLABORATIVE MANAGEMENT OF A PROTECTED AREA →						
	Actively consulting	Seeking consensus	Negotiating	Formally sharing authority and responsibility	Transferring authority and responsibility	
No interference or contribution from other stakeholders						No interference or contribution from the agency in charge
	Increasing expectations of stakeholders →					
Increasing contributions, commitments and "accountability" of stakeholders →						

stereotypes or capture of benefits by elites; identifying the most vulnerable people, participatory analysis of the governance process and in some cases also enabling policies relating to benefit sharing and representation of women and marginalised groups.

This includes recognising and engaging women as workers within a protected area or OECM, including as managers,[50] and ensuring that they have equal opportunities in training, career advancement and other rights. Special efforts may be needed to hire women in gender unequal societies. Women-only training for rangers may be appropriate in some situations, along with inclusivity training for male protected area managers. Care may be needed to address issues of maternity leave and support for mothers such as flexible working hours,[51] particularly in societies with fewer social safeguards. Bringing women in from further afield, for example as researchers, can provide positive role models, ideally linked to mentoring systems. Restoration, particularly of ecosystem services, must be gender sensitive and responsive to the interests and needs of women. And in relations with local communities near area-based conservation initiatives, attention is needed to ensure that the voices of women, and minorities, are heard during any discussions about management, rights and needs. The engagement of male champions is another important tool to tackle gender inequalities.

Employment and other actions to address poverty: Protected areas and the kinds of natural landscapes and seascapes likely to be recognised as OECMs are often in rural areas with few economic opportunities and limited educational facilities. In situations where jobs are scarce and out-migration a frequent problem, protected and conserved areas can help by providing both permanent and seasonal jobs and, perhaps even more important, can provide a focus for associated money-making activities including many forms of ecotourism, guiding, homestays, working in hotels, diving equipment hire, transport, manufacture and sale of food and other products associated with the protected or conserved area, and so on.

To some extent, these things will happen anyway if the area is successful in attracting tourists, but in other cases more active steps are needed. Research shows that many protected areas provide significant economic benefits but that these benefits do not always trickle down to the neediest. Indeed, the large majority can accrue to the richest or most powerful members of the community, particularly in those countries with weak governance and rule of law.[52] Local community initiatives can easily be usurped by an elite group. Here, careful governance work within communities and with, variously, policy makers, judicial authorities, development agencies, local businesses and religious groups is needed to ensure that money raised benefits all sectors of society.

Active encouragement can provide added value. In Keoladeo National Park, in Rajasthan, India, the autorickshaw drivers who take people around were trained in bird identification so they can increase fees and tips. In Colombia, Parques Nacionales Naturales has a policy to include local Indigenous people amongst the rangers, providing a direct link to these communities and also some much-needed income and career possibilities. In countries like Nepal and India, a significant proportion of tourism funds go to local communities in at least some of the protected areas.

Access to ecosystem services: One way in which protected areas and OECMs can help to even out inequalities in society is through their role in conserving ecosystem services and ensuring that these reach the neediest. Benefits can either come directly through access to such services or in a limited number of cases through direct financial benefits through Payment for Ecosystem Services (PES) schemes. Protected areas can help provide clean water, disaster risk reduction and important aspects of food and water security (see SDG 2, SDG 6, etc.). For example, Lake Skadar is the largest lake in the Balkans and is a transboundary protected area between Montenegro and Albania, including Skadarsko Jezero National Park in Montenegro.[53] It provides water for coastal Montenegro.[54] Honey production produces around 80 tonnes of honey a year, with annual value of almost US$1 million.[55] Fish production is about 80 kg/ha/year and supports about 400 fishers who harvest bleak (*Alburnus* spp.) and carp (*Cyprinus carpio*), with a value of around US$2.1 million a year. Some of the catch is used for value-added products, mainly canned or smoked fish with a production value of US$1.6 million a year.[56] 300 families are estimated to depend indirectly on the fishing catch.[57]

Examples of effective area-based conservation that support SDG 10 and SDG 5

The most important approaches and tools to address social inequality involve participation, inclusivity and human rights, including gender rights. They can – and arguably should – apply to virtually any type of protected and conserved areas, under any governance models, although it might be hoped that those controlled directly by local communities, and protected areas based in cultural landscapes or around the principle of sustainable use (IUCN categories V and VI) might be amongst the most likely to help address inequalities. There is, as far as we know, no quantitative evidence of this as yet.

Indigenous lands and protected areas: how area-based conservation reduces economic, political and gender inequities

Madidi National Park and surrounding Indigenous territories, Bolivia

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Co-benefit SDGs

David Wilkie, **Lilian Painter** and **Rob Wallace** (Wildlife Conservation Society – WCS).

"Forests are not only important for our income, without them we would disappear as a people."

– Constantino Nay, President of the Tacana People's Indigenous Council –

Background: The Madidi region in north-western Bolivia extends from the glacier-covered peaks of the high Andes down 6,000 metres to the tropical rainforests of the Tuichi and Beni rivers. Madidi itself supports at least 5,500 species of plants, almost 9 per cent of the world's bird species (1,028), 254 mammals, 333 fish, 119 amphibians, 113 reptiles and more than 1,809 butterfly varieties. The Madidi region is a priceless biodiversity jewel and led the government of Bolivia to establish, in the 1990s, the Madidi, Pilón Lajas and Apolobamba protected areas.[58]

Sustainability challenge: Though Madidi national park covers 18,958 km², the resident white-lipped peccaries and jaguar do not think it is large enough. Camera trapping by Wildlife Conservation Society (WCS) and the National Protected Area Service (SERNAP) showed that these wide-ranging species also spend time foraging for food outside the park in lowland forests that are the traditional territory of the Tacana Indigenous people. The same is true for Andean bear and Andean condor at higher altitudes in the park.

Towards the end of the 1970s, a new development policy was promoted by the Bolivian government in northern La Paz, known as "The March Towards the North". This encouraged and enabled the migration of colonisers from the altiplano highlands to the Amazonian lowlands resulting in an increase in deforestation to produce timber, crops and cattle. This land grabbing continued for 20 years and was fragmenting the landscape, creating barriers to wildlife movement.

Case study

In 1990, the Indigenous peoples of the lowlands mobilised and the Confederation of Indigenous Peoples of Bolivia (CIDOB) led "The March for Territory and Dignity" where hundreds joined a procession from Trinidad, through Beni, all the way to La Paz. The march was a clear public statement to the government demanding legal recognition of their lands and the promulgation of laws recognizing the territorial, social and cultural rights of the lowland Indigenous peoples. It was at this time that the Tacana, Leco and T'simane Indigenous peoples demanded formal rights over their ancestral territories.

Sustainability solution: In 1992, the Tacana Indigenous People's Council (CIPTA) was formed as the representative body of the Tacana people. The Leco formed their representative organisation (CIPLA) in 1996. These Indigenous organisations were the first time either group had attempted to make decisions collectively regarding defense of their rights. Prior to this, decisions were all made at the extended family level. With the technical assistance of WCS, the Tacana and the Leco formalised their organisations based on democratic principles of transparency, accountability and equitable representation. In terms of gender and intergenerational issues, women are increasing their participation in leadership positions and youth participation is being promoted to increase their voice. In 1997, CIPTA and CIPLA submitted requests to INRA (the National Agrarian Reform Institute) to secure legal land tenure over their ancestral territory.

Soon after, both the Tacana and the Leco began the complicated process of planning how they would manage and use their territories once they secured title from the government. This involved: a) participatory assessments of existing land and resource use; b) discussions of how to partition their territory into different land-use zones; c) decisions on how to manage access and use of natural resources; and d) development of rules for operating community enterprises based on sustainable resource use. As people engaged in this participatory planning process, each gained a practical understanding and hands-on experience in democracy building, and learned new skills in spatial planning, conflict resolution, negotiation and reaching consensus.

It was not until 2003 that the government formally recognised 50.6 per cent (389,303 ha) of the original Tacana territorial demand as a Tierra Communitaria de Origen (TCO – i.e. ancestral community land). A portion of the TCO (39,430 ha) overlaps Madidi National Park. In 2008, the Lecos obtained legal title from INRA. Their TCO currently covers 238,162 ha (36.4 per cent) of their original territorial demand, of which 231,000 ha is within Madidi National Park.

Because both ancestral community lands partially overlap with Madidi National Park, both Indigenous organisations work closely with the national protected areas services to ensure that park regulations respect the rights of the Tacana and Leco and that the access and use norms that are part of each Indigenous people's territorial management plan support conservation of the park's ecosystems, plants and animal species. This cooperation has also resulted in conservation efforts that have reduced inequalities and secured sustainable livelihoods of Indigenous people in the area.

Furthermore, all TCOs are held under collective title and cannot be bought or sold and their management is founded on a strong cultural connection to nature and long-term, sustainable use principles. As such they should rightly be seen as Other Effective area-based Conservation Measures (OECMs) or could easily be categorised as IUCN category VI protected areas.

Today CIPTA oversees the activities of 18 community enterprises that generate revenue from sale of the skins and meat of sustainably harvested spectacled Yacaré caiman (*Caiman yacare*), commercial fishing of invasive *Arapaima* fish, gathering and sale of Amazonian fruits, sustainable timber production, wild cacao gathering, handicraft production and ecotourism. A diversity of enterprises is important to the Tacana because: a) it ensures that all segments of society benefit, b) market down-turns are unlikely to happen to all enterprises at the same time, and c) though any one enterprise may not be particularly lucrative, together

they generate a large stream of revenue such that the average household has a net income of US$3,349 per year of which 52 per cent is derived from sustainable natural resource use, including both activities linked to markets as well as subsistence use. In terms of gender, the participation of women in these conservation-linked enterprises accounts for 40 per cent of household income, which more than doubled between 2000 and 2012.

Similarly, as part of CIPLA's Life Plan for the TCO, they explicitly included rules as to how benefits generated from the sustainable use of their territory would be equitably distributed amongst Leco families.

Respecting and protecting the legitimate territorial rights of the Tacana, Leco, T'simane and Moseten is not only ethically appropriate, it ensures that Madidi National Park is effective in conserving the peccaries, jaguar (*Panthera onca*), lowland tapir (*Tapirus terrestris*), harpy eagle (*Harpia harpyja*) and other wildlife that spend time both within the protected area and in the Indigenous peoples' territories.

Since securing legal title and implementing territorial natural resource management plans, both Tacana and Leco families are better off, deforestation is significantly lower than in adjacent areas, CIPTA and CIPLA have successfully developed democratic governance systems for monitoring the state of, and for sustainably using, the natural resources within their lands and waters. Lastly, both CIPTA and CIPLA now play an active role in guiding the management of Madidi National Park and by doing so have gained the respect of the government as effective community organisations increasing their political power to engage regional and national authorities and influence decisions that affect the lives of the Tacana and Leco.

Lessons learned: When Indigenous organizations successfully mobilize and achieve the formal recognition of their ancestral lands and organizations by the state this dramatically increases the authority of previously marginalised communities to decide their current and future development pathways. There is ample evidence that

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Indigenous people's governance of their territories substantially increases the spatial scale of OECMs and strengthens the conservation and sustainable use of collaboratively managed state protected areas. Effective area-based conservation that empowers Indigenous people is a key for achieving conservation that is durable and resilient to climate change. It is also the foundation of sustainable development, equitable benefit sharing, integration of under-represented groups in conservation and development decision-making and delivering on SDG 10.

Case study

Improving women's lives through conservation

Terai Arc Landscape and its network of protected areas, Nepal

Biogas greatly reduces household consumption of firewood, women's workloads and indoor air pollution, improving women's lives while enabling degraded forests to recover.

Background: The forests and grasslands of the Terai Arc harbour populations of tiger (*Panthera tigris*), one-horned rhinoceros (*Rhinoceros unicornis*) and Asian elephant (*Elephas maximus*). Initially conservation efforts were focused on isolated protected areas, but realising this approach was not adequate to conserve these wide-ranging species, in 2001 a landscape approach was introduced with integrated conservation strategies to benefit people, nature and wildlife. The Terai Arc Landscape straddles the Nepal/India border, connecting isolated protected areas through forest corridors and buffer zones so that wildlife can move, disperse and flourish. The Nepal portion of the landscape (referred to hereafter as TAL) covers over 24,700 km² in the low-lying southern part of the country and the Churia range, stretching from the Bagmati river in the east to the Mahakali river in the west.

The current TAL goal is to conserve the ecosystems of the Terai and Churia hills in order to ensure integrity of ecological, economic and socio-cultural systems and communities. TAL includes six protected areas and associated buffer zones, and seven forest corridors. TAL is home to more than 7.5 million people, some of whom live in rural areas adjacent to the protected areas and in the seven corridors.[59] The Terai is the "rice basket" of Nepal; the main sources of income for households are agriculture, animal husbandry, employment and remittances. Forests serve as a safety net for many rural households in the landscape, particularly poor families who depend on natural resources.

Sustainability challenge: In 2019, Nepal was ranked 148th out of 189 countries in the world by the Human Development Index (HDI), with 22.3 per cent of the population estimated to be vulnerable to multidimensional poverty. The same report outlines how its Gender Development Index was in the lowest of five groups worldwide with little equality in HDI achievements of women compared to men. For example, on average men had 6.4 years of schooling while women had only 3.6 years; similarly, average per capita income for men was US$3,510 but only US$2,113 for women. Women are also often more vulnerable to climate change than men.[60]

Co-benefit SDGs

Smriti Dahal (WWF Nepal), **Judy Oglethorpe** (WWF US) and **Shant Jnawali** (WWF Nepal).

Men and women use forests in different ways in TAL. Women are highly dependent on forest resources for the wellbeing of their families, including firewood for cooking, wild foods, medicinal plants, fodder for their livestock, and water. Collection of firewood and water is extremely time-consuming and laborious; women may also face risk of human–wildlife conflict and gender-based violence while collecting forest resources. Indoor air pollution from cooking over wood fires often causes respiratory infections in women and young children. Overharvesting of firewood has been a major threat to the forests of the Terai Arc, causing forest degradation. While women understand the importance of conserving forests and their resources, they are often constrained from fully engaging in decision-making over their forests due to a strongly patriarchal culture that adversely affects their position in society and results in inequitable distribution of rights, resources and power.[61] They also have limited livelihood options, and often have poor access to healthcare. As men migrate out to cities and other countries in search of employment, many rural households have been headed by women over the last few decades. This has given women additional responsibilities of running family farms, making household decisions, and increasingly, taking on roles in community forest management.[62] Recently, due to the COVID-19 pandemic many men have lost their jobs and returned home; the loss of remittances for many households is straining household finances. Increased food insecurity has been reported because of the pandemic.

Conservation solutions:

Implementation of the official TAL Strategy is undertaken by the Government of Nepal and many non-governmental organisations, community-based organisations and donors. These include local community forestry and buffer zone organisations, the Federation of Community Forest Users Nepal (FECOFUN), WWF, CARE Nepal, the National Trust for Nature Conservation, and the US Agency for International Development (USAID)'s Hariyo Ban Program. Engagement with local communities and community stewardship of forests and other natural resources in TAL is a core component of the TAL Strategy. There is a particular focus on improving the livelihoods and participation of forest-dependent women and other marginalised groups through a range of sustainable interventions and strategies developed from evidence-based learning. Given the importance of natural resources for women, a strong focus on gender equality and women's empowerment makes sense.

Activities at community level in critical forest corridors and buffer zones include promotion of modern farming technologies to contribute towards increasing farm productivity and household food security. To reduce fuelwood dependency and relieve unsustainable pressure on forests, partners promote alternative energy and energy efficiency including biogas and improved cookstoves. This cuts the time women spend collecting fuelwood and cooking, reduces the risk of encounters with wild animals, and improves their health by reducing their exposure to indoor air pollution. Slurry from biogas can also be used as fertiliser on fields and kitchen gardens. If latrines are introduced with biogas units, household health is improved through better sanitation. Over the years, WWF has supported the installation of nearly 25,000 household biogas units in TAL.

In many places, TAL partners have supported improved water supplies by piping water from clean sources to villages, reducing diarrhoeal diseases and saving women's time and work in fetching water. In some locations, support has included testing for naturally occurring arsenic, and water treatment where needed. Improved water supply interventions are combined with forest management and restoration in degraded watersheds to help ensure water security. WWF Nepal has worked with female community health volunteers and health partners to develop linked health and environment messages, promote improved health practices and increase women's access to health services.

Local-level participatory climate risk assessments have revealed that community water supplies, agricultural livelihoods, forests, settlements and infrastructure often face risk from the effects of increased drought, floods, landslides and forest fires due to more extreme weather events induced

by climate change. Climate-smart watershed restoration and management, adapted agricultural practices, forest fire control interventions and other measures have been supported to enhance community resilience and adaptation, with particular focus on building resilience of women and other vulnerable groups.

By reducing time spent collecting firewood and water, women have more time for household chores, childcare, livelihood activities and work in their communities, and girls have more time for education. Solar lighting helps rural scholars study in the evenings. TAL partners also promote vocational training so that forest-dependent women and other marginalised groups can acquire new skills, enabling them to seek employment or establish small businesses. Low-interest loans through cooperative-run micro-credit schemes help finance women-run businesses, such as tailoring, poultry-raising, and setting up small shops and beauty salons. Skills training and micro-loans can help lift some of the poorest women and their families out of poverty and reduce pressure on forests.

Partners work closely with women's groups and promote women's participation in forest management and governance. Over the years, they have built women's capacity to take part in community forest and buffer zone management by: increasing their knowledge and understanding of their rights; developing their confidence to speak up in meetings, claim equitable benefits, and take part in decision-making about their resources; and building administrative and leadership skills for office-bearing positions in their groups. In 2017, over 600 women who had been empowered through leadership roles in community forestry user groups (CFUG) went on to run for election under Nepal's 2015 Constitution and won seats at local government level.

This gender-sensitive approach is backed up by government policy. The 2015-2025 TAL Strategy and Action Plan states that there will be increased representation of women and marginalised people in strategy implementation, management, administration and governance; all decision-making bodies will actively engage women and marginalised groups for equitable representation; and gender-based violence and hardship related to natural resource management will be addressed.[63] Nepal has a very strong community forestry movement, with over 22,000 CFUGs and other community based forest management groups nationwide, and there are many CFUGs in the TAL corridors. Gender measures for CFUGs are supported by government policy: the Community Forest Development Guideline requires 50 per cent representation of women on the executive committee of a CFUG, and either the president or the secretary must be a woman. The bank account of the CFUG needs to have the signature of either the president or the secretary and the treasurer; of these two signatories, at least one of them must be a woman. In addition, 35 per cent of CFUG income should benefit the poorest members of the group.

Buffer zones are subject to the Government of Nepal's Buffer Zone Management Regulation and Guideline. Communities living in buffer zones have some sustainable use rights to natural resources, and benefit-sharing of 30-50 per cent of protected area revenue. Buffer zone communities form buffer zone user groups (BZUGs); this provides a forum through which communities engage in formal dialogue with park authorities and play an active role in natural resource conservation. Each BZUG must have at least one woman among the three Executive Members of the group: the chair, secretary or treasurer. At the next level up, the buffer zone users committee (BZUC) represents a group of BZUGs within part of the buffer zone. Two members of each BZUG are elected to the BZUC (one woman and one man). Each BZUC has nine to 11 executive members, including at least three women. A higher committee for the whole buffer zone includes the chairs from each BZUC and is chaired by the protected area warden.

Meaningful participation by women has increased in forest user groups in buffer zones and forest corridors in TAL, though there is still room for improvement. Many CFUGs are using governance tools to increase participation of women and marginalised groups, promote transparent

Raj Kumari Pariyar from Madi village near Chitwan National Park. Since she installed biogas and stopped cooking over an open fire her health has improved and she has more time for farming.

practices and ensure equitable sharing of the benefits generated from natural resource management. Women-led user groups are engaged in forest restoration and management, and young women participate in patrolling and monitoring community forests. At the same time, as women's participation in forest management and income-generating activities increases, they may be at greater risk of gender-based violence (GBV). Measures are being taken to avoid additional risk of GBV, and where possible to reduce existing risk.

Lessons learned: Gender cuts across many facets of development in TAL, with important implications for conservation. Mainstreaming of gender equality through meaningful participation of women in decision-making is imperative for both improving the lives of women and achieving sound community-based forest management, an essential element for sustaining the important biodiversity of the TAL landscape.

While many women's lives have been improved in TAL through gender-sensitive interventions, achievements in gender equality are still patchy. More investment is needed in policy interventions and to ensure implementation of existing provisions on women's empowerment in order to consolidate and scale up successful approaches.

Reducing poor rural women's workloads is an essential first step to empowerment and participation. Additional labour-saving measures, like alternative energy, improved water supplies and innovative agricultural technologies for women, are required for women to have more time for household tasks, realise their income-generating potential, and take on leadership roles in their communities and forests.

Wildlife conservation can add value through generating revenue for women and reducing gender inequalities. For example, groups of women in several areas across the TAL have developed homestays for tourists to experience local culture and view wildlife, birds and natural bounty in the landscape.

Gender-based violence (physical, verbal, etc.) can be a serious barrier for women to become more involved in forest management; awareness raising, mainstreaming GBV prevention in local policies, encouraging women to work together on the issue, linking them with specialist organisations tackling GBV, and engaging men and decision-makers are important strategies for reducing GBV in natural resource management.[64]

Male champions and decision-makers play crucial roles as change agents in creating an enabling environment to empower women and encourage their participation. Engaging men to become champions is critical at multiple levels – in communities, community-based organisations, government and non-government organisations.

Case study

Reducing local inequalities through protected area management

Dzanga-Sangha Protected Area, Central African Republic

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Co-benefit SDGs

Julia Barske (WWF Germany) and **Franck Mavinga** (WWF Central African Republic).

Dzanga-Sangha

Background: In the south-western corner of the Central African Republic, a mosaic of ecosystems, including rivers, streams, marshlands and grassy glades called *bais*, supports critical populations of rare and endangered species including forest elephants (*Loxodonta cyclotis*), western lowland gorillas (*Gorilla gorilla gorilla*) and several antelope species. Here lies the Dzanga-Sangha Protected Areas (DSPA) Complex, covering an area of about 4,500 km², where WWF and its national conservation partners are committed to working with the local Indigenous people in the safeguarding of their forest. The importance of this landscape was recognised through the creation of the Dzanga-Sangha Protected Area Complex in 1990 and its subsequent integration into the Sangha Trinational (TNS) in 2000, a transboundary landscape and UNESCO World Heritage site (2012) which also includes the protected areas of Lobeke (Cameroon) and Nouabale Ndoki (Republic of the Congo).

Large mammals such as forest elephants, gorillas, forest buffaloes (*Syncerus caffer nanus*), giant forest hogs (*Hylochoerus meinertzhageni*), chimpanzees (*Pan troglodytes*), and bongos (*Tragelaphus eurycerus*) are found in very high densities in Dzanga-Sangha. At the Dzanga saline, around 5,000 elephants have been individually identified over the past 20 years and about 2,000 individuals visit the bai (saline) at least once a year. Permanent gatherings of dozens of elephants, buffaloes, bongos and gorillas in the Dzanga bais offer a unique wildlife spectacle and constitute the main international appeal of the DSPA for tourism.

Sustainability challenge: DSPA presents unique potential to couple conservation and sustainable development in partnership with, and for the benefit of, local Indigenous people (over 40 per cent of a population of 8,000 people, according to a 2012 census). Promoting the local development of vulnerable populations while ensuring the conservation of wildlife has been a stated objective of the proponents of the DSPA since the beginning of the 1990s,[65] but safeguarding the rights and furthering the sociocultural preferences of the important Indigenous people of Dzanga-Sangha has remained a sensitive issue ever since. Political instability and a lack of effective Indigenous community representation means that discrimination and marginalisation, including limited access to healthcare and

education, and food insecurity continue to be critical challenges.

Conservation solution: Securing basic services, sustainable income generating activities, and collaborative management of natural resources are critical to resilient local livelihoods and key components of WWF's inclusive conservation approach in Dzanga-Sangha.

WWF has been present in Dzanga-Sangha for 30 years, despite the political instability in the country. Together with local and international partners, WWF is working with local communities to strengthen conservation in the DSPA and surrounding landscape through a novel approach that brings together traditional conservation measures and protected area management, with sustainable development, healthcare, education and human and Indigenous rights. This work is supported by a diverse array of partners, including the German government (BMZ and KfW), the European Union, the US Fish and Wildlife Service and private foundations. To ensure long-term engagement and sustainability, two funding schemes have been established: The Krombacher Rainforest Trust Fund as well as the Sangha Tri National Trust Fund.

In Dzanga-Sangha, five main pillars promote conservation and the reduction of inequality:

Income generation: The local population benefits from tourism with 40 per cent of revenues going to support local non-profit associations. In addition, many local and Indigenous people are employed by the park, especially as part of the primate habituation programme.

Strengthening Indigenous culture: An Indigenous youth group has been created and provided with skills and opportunities to actively participate in the protection of their cultural and natural heritage and the defence of their rights. A central mission is to support the intergenerational transmission of traditional knowledge.

Promoting Indigenous and human rights: A Human Rights Centre has been established. The objectives of the Centre are to provide legal assistance and conflict resolution support to the local population and in particular to Indigenous BaAka, and to raise awareness of Indigenous and human rights in the region. The Human Rights Centre also assists the Indigenous population in obtaining birth certificates, which will enable them to fully exercise their legal rights, including access to government services, the right to vote, freedom of movement, etc.

Promoting education: Teachers in local schools are supported by the park. In collaboration with two local partners, two student residences have been built, enabling BaAka children and youth from the villages to attend secondary school in the main town, Bayanga. There is an urgent need to promote continuing education among the BaAka, as only two BaAka have completed their secondary education, obtained their baccalaureate and are now studying at Bangui University.

Access to healthcare: A comprehensive health project has been launched in collaboration with local partners. The project includes strengthening existing rural health centres and setting up a mobile unit to make healthcare and preventive health education accessible to the most marginalised BaAka communities.

Key lesson learned: WWF's experience in Dzanga-Sangha demonstrates the power of inclusive conservation and bottom-up approaches, where local communities are central partners in project design and implementation. Community engagement is a critical factor in sustainable conservation for the benefit of both people and nature, with a good example being the successful Indigenous youth group Ndima Kali. The permanent platform that has been created through DSPA provides a crucial governance framework for stakeholder engagement and funding opportunities to support communities, address inequalities, and ensure conservation impact. Critical next steps include addressing gender inequalities through integrated programme development, employment opportunities, and enhanced engagement of women in project design and implementation.

Case study

Establishment of a protected area empowering Indigenous people

Thaidene Nëné Indigenous Protected Area, National Park Reserve, Territorial Protected Area and Wildlife Conservation Area, Canada

Co-benefit SDGs

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Tracey Williams and **Linda Krueger** (The Nature Conservancy).

The living connection between land and people, between water and land, between forest and barrens makes Thaidene Nëné a National Treasure of Canada. Carrying these relationships into the future, the ecological integrity and Dene way of life of Thaidene Nëné will be a living legacy for all, where the Łutsël K'é Dene First Nation and the Parks Canada Agency/GNWT will welcome the world.

– Thaidene Nëné Establishment Agreement –

Description of the site: In August 2019, the Łutsël K'é Dene First Nation (LKDFN) signed agreements with Parks Canada[66] and the Government of the Northwest Territories (GNWT)[67] to create a new 26,376 km² protected area called Thaidene Nëné, "Land of the Ancestors",[68] in the heart of their traditional homeland in the Northwest Territories. Together with the adjacent Thelon Wildlife Sanctuary, the Thaidene Nëné National Park Reserve and Territorial Protected Area and Wildlife Conservation Area protect an ecological system that is one of the largest terrestrial protected area zones in North America. Thaidene Nëné is now protected under Dënesųłiné [LKDFN], federal and territorial law. All three governments will work together to manage the Thaidene Nëné protected areas, ensuring that Indigenous knowledge and culture are the foundation of protecting the globally significant ecosystem that provides habitat for grizzly bears, wolves, moose and muskox, and the critical winter ground for herds of barren ground caribou (*Rangifer tarandus groenlandicus*).

Sustainability challenge: Although the First Nation had historically resisted the creation of a formal protected area, the recent discovery of diamond and mineral resources in the territory created a development boom that posed new threats to the traditional lands, waters and wildlife for the Łutsël K'é Dene. These development pressures challenged the LKDFN's ability to manage its lands, particularly when coupled with the risks of climate change. In 2000, Chief Felix Lockhart, concerned about this industrial development in the traditional territory, initiated discussions with Parks Canada about the creation of a potential National Park Reserve. The challenge and the vision for Thaidene Nëné was to construct a governance framework for the protected area that would provide the legal and economic

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empowerment for – and be informed by – Indigenous knowledge and stewardship.

Key benefits: The new protected area encompasses the core of the traditional homeland of the Łutsël K'é Dene – areas that include sacred sites and other places of critical cultural and sustenance values for the Nation. Most importantly, the protected area's Establishment Agreements call for Canadian and LKDFN governments to collaborate in the management and operation of Thaidene Nëné, and explicitly aim to protect and promote Łutsël K'e Dënesųłiné culture. This will allow the First Nation to realise its vision of governance, allowing for the continuation of an Indigenous system of intergenerational transmission of knowledge and human connection with the land to inform stewardship and management decisions and policy. The community has begun to set its own agenda to meet its needs for economic opportunities. The park enables them to ensure clean water, with a large portion of the protected area covering a freshwater area of Great Slave Lake, the deepest freshwater area in North America; as well as work to preserve sustainable food sources. The community will meet these needs by creating its own plans, informing multi-party management plans in a meaningful way, and by creating and enforcing its own laws. The Agreements guarantee that Dënesųłiné knowledge be used to make decisions and to develop interpretation and promotional materials for the park, and to protect sacred places and document heritage resources.

While tourism is envisioned as an important opportunity for the park, before visitors enter Thaidene Nëné they will have to register and complete an orientation programme so that they can learn about safety and how to properly respect the land they are visiting. They will also be required to obtain necessary permits and licenses, to be approved by the Management Board.

The protected area provides additional opportunities to promote the use of the Dënesųłiné language, promote the Dene way of life, and ensure the history and culture of the Łutsël K'é Dënesųłiné are shared across Canada and globally.

Case study

Business case: The protected area is not just about biological and cultural conservation, but it is also about promoting a viable economic future for the Łutsël K'é. Thaidene Nëné will foster sustainable economic growth by building park infrastructure in the home community of Łutsël K'é', bringing new stewardship and management jobs to the community, and encouraging ecotourism to the region.

The Establishment Agreements prioritise training and employment for Łutsël K'é Dënesųłiné people and maximising economic opportunities for Łutsël K'e Denesǫłine businesses. Park staff will be chosen in part for their knowledge of Łutsël K'e Dënesųłiné culture, familiarity with the Dënesųłiné language, knowledge of Thaidene Nëné and how to travel and use the land, and community awareness. Construction of infrastructure – including a visitor and heritage centre, administrative offices for park management, and storage for historical and cultural information and objects – will provide opportunities for rental income, as LKDFN expects to own these facilities and to rent space on a long-term basis to Parks Canada and GNWT.

LKDFN has also established a CA$30 million trust fund to support its management and operation responsibilities in Thaidene Nëné. The Trust will provide a long-term revenue stream that will be instrumental for achieving stable operational, stewardship and management objectives set for Thaidene Nëné by LKDFN.

Lessons learned: Establishing the Thaidene Nëné protected area could only become a viable solution for its most invested Indigenous human community once their leadership, voice and traditional knowledge were recognised and prioritised in all aspects of the management, planning and economic activity in the park. The Establishment Agreements for the park treat LKDFN as a legitimate government with treaty rights and deep knowledge and connection to the landscape, and thus permit the creation of an area that enhances the leadership and authority of the local community and creates a more effective vehicle for multiple values to be preserved and protected in cultural and biodiversity conservation.

Next steps: The newly created LKDFN TDN Strategic Plan started implementation in 2020. This includes creating the visitor orientation programme and related infrastructure.

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SDG 11: Sustainable cities and communities

Summary for policy makers

Over half the world's population now lives in cities, a dramatic shift that still shows no sign of slowing down. Cities have huge footprints in terms of resources and energy, and also face many internal problems from urban pollution, inadequate water supplies, poor sanitation, disaster risk and disease – all challenges that SDG 11 attempts to address. Effective area-based conservation offers many options discussed, for instance, under SDGs 3, 6 and 13, but there are several city-specific issues, including:

- **Disaster risk reduction** through using natural ecosystems for coastal protection, soil stabilisation to prevent dust storms, protection of steep slopes and wetlands and riverine habitats to slow water flow and reduce soil sealing and flood risk
- **Improving air quality** through carefully planned vegetation and the retention of parks and gardens
- Managing, expanding and to some extent rewilding **green spaces** in cities to maximise their potential to supply areas for exercise, relaxation and emotional wellbeing
- **Sustainable livelihoods for communities** by supporting local food production, tourism, buffering against extreme weather, etc.
- Maintaining or restoring habitat **connectivity** within cities to maximise benefits for both biodiversity and people.

Many protected and conserved areas contribute to sustainable cities: nature reserves inside urban areas, larger protected areas adjacent or nearby, and a wide variety of commons, parks, watershed protection areas, zoos, botanical gardens and the grounds of religious buildings, all integrated within a network of green space.

What is the challenge?

We are becoming a global community of city dwellers. This creates two challenges: how to address the needs of rapidly expanding cities and how to support the smaller communities, which may themselves have changed dramatically through out-migration and an aging population.

Today, for the first time in human history, most people live in cities. Many seldom ever leave the city; many people will never move away from the city in which they were born and will have little interaction with the natural world. Others, in all socio-economic classes, move between the city and the country on a regular basis. The dramatic paradigm shift from country to city has profound implications for both rural and urban populations.

Although cities have played a critical role in civilisation since the 3rd millennium BCE, until very recently people lived mainly in rural areas or small settlements. Before 1800, cities contained less than 2.5 per cent of the world's population.[1] Industrialisation witnessed a massive increase, particularly in Europe and North America, so that by 1900, a tenth of the global population lived in cities,[2] and by 1960, a third.[3] In 1990, there were still only 10 cities with over 10 million inhabitants[4] but by 2017 there were 34,[5] and by 2030, 13 new megacities are expected to emerge.[6] In the 21st century, cities are merging, forming massive urban, suburban or peri-urban sprawls.[7] In 2007, 5,000 years after the first cities, the global balance tipped, with more people living in urban than rural areas.[8]

This shift is likely to continue. Africa is the fastest urbanising continent, from a situation in 1960 when there were only five cities in sub-Saharan Africa with over half a million inhabitants to 2015 when there were 84; by 2030 there will probably be over 140.[9] Africa's urban population is expected to rise by over 300 million between 2000 and 2030[10] and to be 1.23 billion by 2050,[11] with urban land cover likely to increase twelve-fold from 2000 to 2050,[12] particularly in the east and west.[13] For now, this global trend seems irreversible.[14]

Cities cover 3 per cent of the Earth's land,[15] about 200,000 km² in total, but have unprecedented levels of consumption and waste.[16] City dwellers, particularly in developed countries, buy goods and energy that use resources and cause pollution and climate change in many countries.[17] More tightly packed people with higher wages[18] also change consumption patterns, with increasing consumption of meat, dairy and processed foods taking up more land resources.[19] The *footprint* of the city – the impact that it has beyond its boundaries – has components related to food, water, transport infrastructure, biodiversity and climate change. Cities cannot be self-sufficient, but the way in which they are planned and developed can radically influence the size of their footprint.

Within the city itself, there are multiple challenges. Some of the most glittering city centres are surrounded by massive slums where people live desperate, dangerous lives of poverty and deprivation. East Africa's slum population tripled in the last 25 years,[20] and includes 72 per cent of city dwellers in sub-Saharan Africa.[21] Slums encourage crime, threatening everyone. Municipal authorities have not kept pace with provision of clean water, sanitation, housing, transport, healthcare or schools. Urban air pollution causes global death tolls measured in hundreds of thousands a year, driven by transport pollution, unregulated industries and often by use of woodfuel and charcoal. Woodfuel collection is the largest cause of forest degradation in Africa.[22] Household air pollution from solid fuels causes more deaths than malaria,[23] 7,350-16,200 premature deaths and six million asthma attacks every year in greater Delhi are due to particulate pollution.[24] Cities also act as centres for disease dispersal.[25] Poor planning means many people – usually poor – are exposed to disasters caused by climate events or earthquakes in cities like Dhaka.[26] Soil sealing – with concrete or tarmac – reduces soil life,[27] changes surface albedo (reflection) thus raising temperatures,[28] and increases the chances of flooding[29] with stormwater contaminated with pollutants.[30] Many cities are short of green spaces for people to relax, leading to social tensions and to nature deficit disorder, increasingly recognised as a problem for today's children.

Cities provide many benefits – better jobs, education and lifestyle – which is why people move there. They can also provide important opportunities for sustainable living, with per capita resource consumption much less than it is in more dispersed populations.[31] But this assumes good planning and infrastructure and at present many cities continue the unsustainable use of ecosystems near and far. Addressing these multiple obstacles is the role of city planners and politicians around the world – a task that is getting more complicated all the time.

At the same time, communities outside cities are facing different but related challenges. Out-migration can alter power balances and undermine traditional farming systems. Out-migration of men from mountain villages has caused pasture degradation in Pakistan; women, children and older people are unable to enforce traditional user limits and outsiders have been grazing large numbers of animals.[32] In Nepal, an exodus from upland areas has meant farm soils in these areas are now less fertile due to the fact that labour shortages have led to fewer livestock and less manure.[33] Demands from urban areas conversely put rural communities under pressure; there is an increasing disconnect between cities and their surroundings.[34] The rapid spread of cities means that peri-urban areas are often subject to compulsory purchase, land acquisitions and tenure changes that have damaging social and environmental impacts.[35]

This SDG focuses on the massive task of building safe, pleasant and resilient cities and communities, with "*participatory, integrated and sustainable human settlement planning*". Target 11.5 aims to reduce disasters, including water-related disasters, with direct links to effective area-based conservation; this issue is examined under SDG 13. Target 11.6 aims to "*reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management*", while 11.7 focuses on "*universal access to safe, inclusive and accessible, green and public spaces…*". 11.A seeks better links between urban, peri-urban and rural areas and 11.B aims for "*integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters*" in line with the Sendai Framework for Disaster Risk Reduction 2015-2030. Target 11.4 is to "*Strengthen efforts to protect and safeguard the world's cultural and natural heritage*", which has a key place in our analysis but appears to be aimed at natural and cultural World Heritage sites and seems an odd fit with the other parts of the target.

How can effective area-based conservation help?

Area-based conservation provides many of the ecosystem services that cities and communities need to function, as described elsewhere: for instance, for food security (SDG 2), support for healthy living (SDG 3), to provide freshwater to urban areas (SDG 6), help mitigate climate change and disasters (SDG 13) and support biodiversity conservation (SDGs 14 and 15). Some of the SDG 11 targets outlined above in effect repeat these general aims through an urban lens, others are focused more explicitly on needs that are specific to cities. In all the cases below, both fully protected areas and other natural or semi-natural systems, including OECMs, have benefits to offer.

Providing green space: Parks, gardens and nature reserves within cities are increasingly recognised as vital safety valves to allow space for relaxation, exercise and emotional wellbeing.[36] But not all green space is equal. Parks with higher biodiversity were found to provide greater restorative benefits, independent of age, gender or ethnic background.[37] While many urban parks will be rather artificial environments and not suitable as protected areas, a growing number of municipal authorities are leaving parts of the area to go back to nature, or with only light management, making them suitable as OECMs. Just as important, protected areas next to, close to or sometimes even within a city provide important biodiversity conservation at the same time as providing a wide range of other ecosystem services. Demand can be incredibly high: Bukhansan National Park, outside Seoul, Korea, receives 5-10 million visitors a year.[38]

Improving air quality: Green space in cities has an additional benefit: it can improve air quality. Trees mitigate problems of urban heat islands, sequester carbon dioxide and help to trap air pollutants on their leaves,[39] although choice and location of vegetation help determine its effectiveness in pollution reduction.[40] Urban parks, of varying degrees of naturalness, can play an important role in both reducing air pollution and in giving city dwellers cleaner environments in which to exercise.[41]

Sustainable livelihoods for communities: Protected areas and OECMs also provide support for communities of any size; including direct provision of food from marine protected areas, various ways of buffering communities against weather-related problems and the role of tourism in boosting local income. These benefits have been described in other sections, but have particular relevance to communities, and several of the case studies describe these.

Disaster risk reduction and climate adaptation: Most of the world's megacities are located in coastal areas,[42] and many are therefore vulnerable to both sea-level rise and the increased storm events expected under climate change.[43] Settlements in arid environments like Kuwait City[44] suffer increasing dust storms resulting in increased bronchial asthma and mortality.[45] Soil sealing leads to measurable increases in the scale and severity of flooding.[46] Breakdown of ecosystem services has been identified as the root of many urban "natural disasters", perhaps most famously after Hurricane Katrina, which devastated large areas of New Orleans after the natural defences previously provided by coastal wetlands had been degraded and destroyed.[47] Increasingly, city residents are appreciating the value of natural defences to provide some or all of the buffering necessary to prepare for extreme weather events or tsunamis:[48] coastal mangroves and swamp forests, coral reefs and wetlands, inland flood plains, riparian forests, vegetation cover on steep slopes and stabilisation of soils in drylands. This can be as a stand-alone form of protection or through integrating eco-DRR with engineering responses,[49] and research suggests that interest in ecosystem-based disaster risk reduction for cities is growing fast.[50] Green infrastructure is identified as a critical element in addressing soil sealing.[51] Green spaces in cities can help to reduce urban temperatures. Restoration often plays a critical role in urban DRR.[52]

Finally, it is important that urban protected areas and other green spaces do not remain as isolated "islands", but are connected into a coherent network, ideally also linked to ecosystems beyond the city boundary. The form and extent of these linkages will to some extent be determined by the prior history and design of the city, although increasingly urban planners are trying to restore biological corridors and other linking habitats.[53] Such links are not only important ecologically, but also help people living in cities to be more closely connected to a wider environment beyond urban limits. Natural corridors like rivers are particularly important; survival or re-emergence of aquatic animals can provide an important focus of public interest and encourage water clean-up activities.

Approaches that support SDG 11

All the values described throughout this report have relevance to communities and these benefits can come from any management approach or governance type. But in addition, there are several specialised protected and conserved areas that are particularly suited to urban and community resilience:

Protected areas

- **Urban nature reserves:** Are critical elements here and can exist successfully even in huge, crowded cities.[54] Such places will inevitably have limited biodiversity but provide learning places for children and others. Larger animals that survive there can become locally famous, like the cougar living in the Hollywood Hills of Los Angeles. Here the emphasis is less on protecting intact ecosystems, which are unlikely to have survived within a town or city, but to maintain or restore semi-natural areas that provide both some biodiversity conservation and space for people to appreciate nature.

- **Protected areas adjacent or near to cities:** A surprising number of cities have natural areas that have survived, or been protected, nearby: famously this includes places like Nairobi National Park, where visitors can see a fair proportion of Africa's larger game animals with the skyscrapers of Kenya's capital in the background. But many other cities have similar: places such as Mumbai, Seoul, Helsinki, Rio de Janeiro, Cape Town and Paris. Here nature is likely to be wilder but although visitation can be high, they are one step less accessible to city dwellers and many will need encouragement to visit.
- **World Heritage sites:** Rather confusingly, SDG 11 also refers explicitly to World Heritage. Many natural World Heritage sites are large, near-intact ecosystems like Serengeti, and do not really fit the remit of this SDG. But many urban or peri-urban World Heritage sites, particularly cultural sites, also have important natural values, like the jungle fragments around Angkor Wat in Cambodia or the deserts surrounding Petra in Jordan.

OECMs

- **Commons, nature parks, watershed protection areas that qualify as OECMs:** Most cities contain other green spaces of varying naturalness; one important step in addressing sustainability can be to vary management in such places to encourage wildlife and increase the potential emotional capital to be gained by users. Such restoration efforts often need careful stakeholder negotiations; city dwellers are often wary of projects like woodland restoration because of the perceived risk that such places harbour criminals, but many cities have successfully undertaken restoration activities over the last few years. In cities that expanded very fast, as in much of Europe and North America, former parklands, commons or even natural features not suitable for building have been retained and provide important green spaces. Ravenna Park in Seattle is a half mile wooded ravine bought by the city in 1911, now in a densely populated part of the city close to the University of Washington but retaining many natural features of the original forest.
- **Community conserved areas:** The type of governance involved is important in these contexts as well. An increasing number of communities are setting up or managing their own protected areas, both within cities and at the edges of smaller communities. These places often do not contain iconic wildlife or rare species but have huge importance as daily places for relaxation for local people. In the industrial city of Birmingham in the British West Midlands, Mosely Bog is a Local Nature Reserve, famous as the childhood play space of JRR Tolkien, author of *Lord of the Rings*, and the wild areas remind fans of key images from the books.

Key complementary approaches

These may be applied in protected areas, or OECMs, or in other effective area-based strategies:

- **Corridors:** Many cities have the potential to maintain biological corridors using existing features, such as natural habitats along rivers, streams, coastline, mangroves, rocky outcrops or similar. Sydney maintains a protected area that functions as an effective corridor along several miles of its coastline, while residents of Washington DC can walk out of the city along the banks of the Potomac to natural woodland, even though this is surrounded on both sides by urban sprawl.

Case study

A city in nature – Singapore's vision of restoring nature into the city

Network of urban nature reserves, parks and other green areas, Singapore

Co-benefit SDGs

Chee Chiew Leong, Boyi Zhou (National Parks Board, Singapore Botanic Gardens) and **Chris Hails.**

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Background: One degree north of the equator, Singapore is situated at the heart of a region of high biodiversity. Before the settlement of the British in 1819 led by Sir Stamford Raffles, Singapore was covered with fairly intact tropical rainforest, swamps and mangroves. The naturalist Alfred Russel Wallace visited the island in 1854 and described it as "a multitude of small hills still covered in virgin forest".

A rapidly expanding human population soon took its toll, and most of the forests were cleared for agriculture and the creation of settlements. By 1900, 90 per cent of the primeval forest had been cleared. While the British made efforts to designate forest reserves and nature reserves, the efforts waxed and waned, leaving only a few small forest reserves scattered across the island by 1936. It was not until the 1960s, that the then Prime Minister of independent Singapore, Mr Lee Kuan Yew, made a concerted effort to green up Singapore under the Garden City campaign.

Sustainability Challenge: Mr Lee Kuan Yew had the daunting task of developing a country which had no natural resources, dominated by squatters and deplorable living conditions; it had none of the traditional sources of income and its people were the most precious resource. While preparing to develop the city, Mr Lee Kuan Yew had a clear vision of the environment he wanted to create, "*I have always believed that a blighted urban landscape, a concrete jungle destroys the human spirit. We need the greenery of nature to lift up our spirits*". He envisioned that a clean and green environment would enable Singapore to "*distinguish [herself] from other Third World countries*" and gain a competitive edge by encouraging "*businessmen and tourists [to make her] a base for their businesses and tours of the region*". In order to achieve Mr Lee's vision, a balance between development and the conservation of greenery was needed.

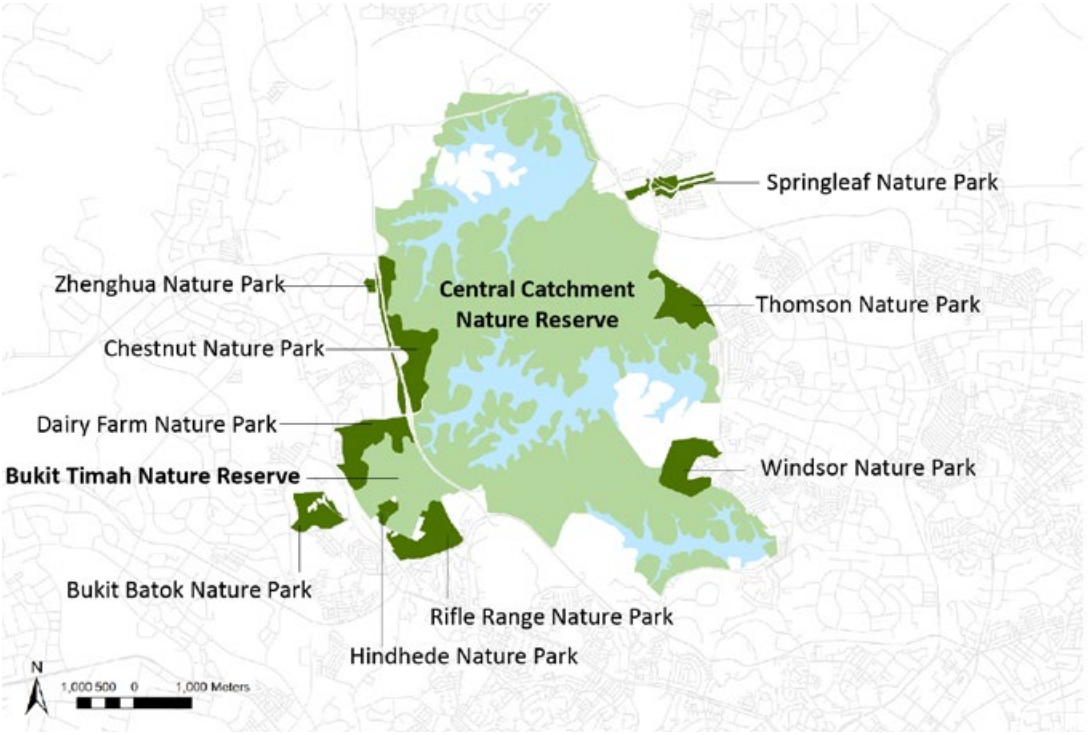

Figure 11.1: Nature Parks that buffer the Central Catchment Nature Reserve and Bukit Timah Nature Reserve

Conservation Solution: In the early years, Singapore established clear parameters for greenery through park provision standards and road codes, to ensure greenery was incorporated in the planning process. A national tree planting campaign was launched in 1963, and subsequently an ambitious "Garden City Campaign" in 1967. The initial focus was on tree planting for greenery and shade, and by 1974 nearly 160,000 trees had been planted. The activity became a community affair engaging civil society groups, and government and private developers were required to include green areas and trees in all new construction schemes.

In the 1980s, the government commissioned a study which took a more ecological approach to the conservation of remaining biodiversity-rich habitats, urban and parks plantings, and the development of ecological corridors. Birds were the indicator group around which these initial plans were built: if habitats for birds could be conserved, created and connected, it would be the first step towards an ecologically sound planning system.

In 1990, the government formed the National Parks Board (NParks), which in 1996 took over the management of all aspects of Nature Reserves and green spaces in the country. Singapore signalled its commitment to the environment by signing several international agreements including the Convention on Biological Diversity, the UN Framework Convention on Climate Change and the UN Convention to Combat Desertification, which were opened for signature at the Earth Summit in Rio de Janeiro in 1992. Singapore also became part of the UN Forum on Forests, and a signatory to the Convention on International Trade in Endangered Species of Wild Fauna and Flora.

The Garden City established Singapore's basic network of gardens, parks and greenery, linked by a network of green corridors called Park Connectors. From this momentum, the concept of the "Garden City" evolved into a "City in a Garden", which strived to make greenery even more pervasive island-wide. The Park Connector Network was extended further. In the built environment, work began to simulate the services of tropical rainforest by creating multi-layered vegetation both in green space plantings and on buildings. These initiatives improved the environment and made Singapore more liveable amidst a growing population.

In 2015, NParks launched a holistic Nature Conservation Masterplan,[55] which charts the course of Singapore's future biodiversity conservation efforts through the four key

Case study

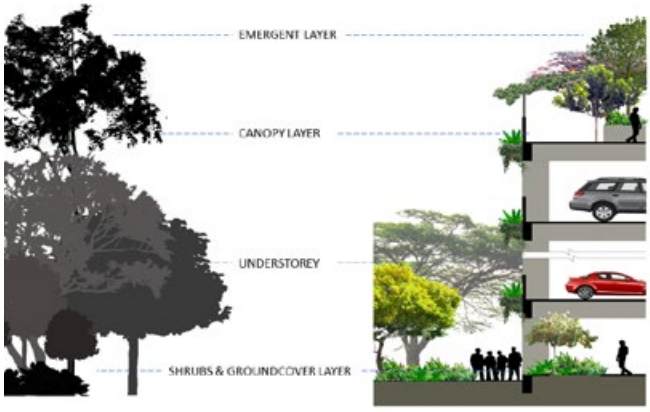

Figure 11.2: Replicating the structure of tropical rainforests in the built environment.

areas of (i) conservation of key habitats, (ii) restoration, enhancement and species recovery, (iii) research on conservation biology and planning, and (iv) public outreach and community stewardship.

Four nature reserves, two of which are listed as ASEAN heritage parks (Bukit Timah Nature Reserve and Sungei Buloh Wetland Reserve), currently provide the core refugia for biodiversity, covering representative habitats such as lowland rainforests, freshwater swamp forest, mangroves and mudflats. The boundary between these reserves and the urban environment is often a sharp one, so a series of "nature parks" are being established to buffer the nature reserves, to protect them against the impact of urbanisation, and provide more space for nature-based recreation, such as hiking and bird watching. These nature parks also help take the visitor pressure off core biodiversity areas.

Beyond securing buffer parks adjacent to the Nature Reserves, NParks adopts a science-based approach to nature conservation. For instance, agent-based modelling predicting the movement and settlement of coral propagules[56] helped validate the suitability of Sisters' Islands as Singapore's first Marine Park.[57] The Mandai Mangrove and Mudflat was recently identified for conservation as a nature park following ecological studies demonstrating the complementary role the habitat played in providing a rich feeding ground for migratory shorebirds roosting in Sungei Buloh Wetland Reserve.[58]

Within this matrix, ecological connectivity between green spaces is being enhanced. "Least resistance" pathways for various fauna have been modelled using GIS technology so that ecological corridors have a sound scientific basis.[59] To establish these corridors, greenery along streetscapes are intensified, resulting in multi-tiered planting replicating the natural structure of forests, known as Nature Ways. Nature Ways are also planted with native flora, with a special emphasis being placed upon food plants for indigenous birds and butterflies to facilitate the dispersal of native biodiversity. Further extended walking and cycling trails for nature and recreation, such as the Round Island Route and the Coast-to-Coast Trail, help to strengthen the connectivity between Singapore's pockets of green spaces and create a more extensive Park Connector Network.

To ensure that the 2 million urban trees in parks and streetscapes are healthy, NParks has put in place a comprehensive tree management regime that includes regular inspections and pruning, professional certification of staff, and leveraging on technology. Advanced tree assessment is carried out using diagnostic equipment such as the resistograph and tomograph. Drones are used to conduct aerial inspections. Data models, such as the Tree Structural Model, are used to project the stability of trees under different wind speeds.

Habitat enhancement and species recovery programmes have been put in place to further conserve threatened, native biodiversity. For example, seamless water–land interfaces are created by breaking open concrete canals and re-wilding of rivers. Together with the reduction of pollution and the cleaning of waterways, these efforts have resulted in a natural re-establishment of the once extirpated Smooth-coated Otter (*Lutrogale perspicillata*) with a population now numbering more than 80 individuals which have penetrated the city centre.

Once locally extinct, a small group of 15 Oriental Pied Hornbills (*Anthracoceros albirostris*) were discovered on an offshore island in 1994. This triggered trials with nest boxes that eventually resulted in a healthy population of these magnificent birds living wild, right in the heart of the city, thriving off the ecological corridors and green spaces and the now-mature fruiting trees planted there. Other species recovery programmes covering

plants to invertebrates are underway covering marine, freshwater and terrestrial habitats.

Today, the City in a Garden is home to more than 400 species of birds, 330 species of butterflies and over 250 species of hard corals, accounting for more than 30 per cent of known global hard coral diversity. At least 2,400 native vascular plants have also been recorded, of which more than 1,845 species are classified as extant in Singapore. NParks and its partners continue to monitor biodiversity closely through regular surveys, in both terrestrial and marine areas. Since 2009, 225 species of native vascular plants have been discovered or rediscovered, including the endemic Singapore Ginger (*Zingiber singapurensis*), *Hanguana rubinea* and *Hanguana triangulata*. Surveys in Singapore's natural areas have also yielded notable faunal records, including the Neptune's Cup Sponge (*Cliona patera*), which was once presumed to be globally extinct and *Asiophlugis temasek*, a species of katydid new to science.

NParks has also started to introduce biophilic design in gardens and parks, creating recreational spaces that support both ecological and social communities. The Learning Forest is a 10-ha secondary forest that lies within the buffer zone of the Singapore Botanic Gardens UNESCO World Heritage site. Using historical maps and spatial modelling, NParks restored the original extent of freshwater swamp in the area and extended the forest buffer around them using the framework species reforestation methods. The landscapes in the Learning Forest, such as the Discovery Wetlands and the Walk of Giants, were designed to provide immersive experiences in nature. Today, the Singapore Botanic Garden stands out as the world's premier tropical botanic garden, with its newly developed Seed Bank and arboretum of dipterocarp trees, playing a vital role in safeguarding plant biodiversity in Southeast Asia.

NParks developed active outreach programmes for communities. For example, the Community in Bloom (CIB) gardening movement fosters community spirit and brings residents together to develop a sense of ownership of the greening. Today, there are more than 1,500 community gardens across Singapore, including outdoor and indoor gardening groups. Similar to CIB, Community in Nature (CIN) is a national movement to connect and engage different groups in the community to conserve Singapore's natural heritage. NParks involves schools, volunteers and partners for its CIN programmes that promote and raise awareness of biodiversity and conservation. More than 4,300 citizen scientists have participated in NParks' biodiversity surveys, and more than 400 schools and 58,000 students have taken part in CIN programmes.

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The naturalising of a concrete canal in Bishan-Ang Mo Kio Park through the Active, Beautiful and Clean (ABC) Waters programme.

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Biophilic design of the Learning Forest in the Singapore Botanic Gardens.

Next steps: In March 2020, Singapore announced its new vision of City in Nature. This new vision builds on what Singapore has achieved as a biophilic City in a Garden, to strengthen Singapore's distinctiveness as a highly liveable city, while mitigating the impacts of urbanisation and climate change. As Singapore moves towards becoming a City in Nature, NParks will further restore nature into the urban fabric. Singapore's

Case study

transformation into a City in Nature will be guided by four key strategies – (i) the protection and expansion of Singapore's natural capital, (ii) intensifying nature in gardens and parks, (iii) restoring nature into the built environment, and (iv) strengthening connectivity between Singapore's green spaces.

To protect and extend its natural capital, Singapore will expand its Nature Park Network to our nature reserves, increasing the land area of nature parks by over 50 per cent by 2030. Landscapes in gardens and parks will be curated to make them more natural, bringing forth benefits to health and wellbeing. As part of this effort, our gardens and parks will serve as nature-based solutions for flood mitigation around coastal and riverine areas through the naturalisation of waterbodies. NParks will also work to restore nature into the built environment to mitigate the harshness of the urban environment, through intensifying the implementation of Nature Ways and skyrise greenery, with a focus on greening the hotter areas on the island, including industrial estates. Skyrise greenery has been found to be capable of reducing ambient temperatures by 1.5°C and surface temperature by 18°C.[60] Connectivity between Singapore's green spaces will be further strengthened such that every household will be within a 10-minute walk of a park by 2030, making gardens and parks even more accessible. NParks also aspires to make every road a Nature Way.

A City in Nature will enable the community to forge closer bonds through active stewardship of the environment. Therapeutic gardens and nature play-gardens will bring Singaporeans closer to nature, thereby bringing benefits to health and wellbeing. NParks has also launched the OneMillionTrees movement to plant a million trees across Singapore between 2020 and 2030. Communities will also be invited to take part in the design, building and management of more than 50 parks. The current nature volunteer base of 48,000 is targeted to expand to 70,000 by 2030.

Lessons Learned: The lesson from Singapore is that a small land-constrained island state of 721.5 km², with a population of 5.6 million people, can remain rich in biodiversity and have a community of partners and stewards in nature combined with exceptional economic development. From the early years of its independence, forward planning and concerted efforts to green up the city allowed Singapore to become one of the greenest cities in the world, according to the MIT City Lab Treepedia Index.[61] A home-grown Singapore Index on Cities' Biodiversity,[62] which serves as a self-assessment tool to monitor progress of their biodiversity conservation efforts, has been adopted by 30 cities in the world. In addition, NParks has been awarded the UNESCO Sultan Qaboos Prize for Environmental Preservation in 2017 and the Stephen R. Kellert Biophilic Design Award in 2019.

This has been a huge achievement from such a challenging start only a little over 50 years ago and has placed Singapore as a global leader for integrating modern city living with biodiversity conservation.

Community conserved areas as building blocks for sustainable communities

Community-conserved areas, State of Nagaland, India

© SIDDHARTH EDAKE

"We are now so used to seeing the youth of the villages observing wildlife and plants, that we make a point of guiding them to the areas where we see something interesting!"
– By the women of the villages –

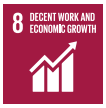
"On my exposure tour to Pakke in Arunachal Pradesh I was amazed to see so many wild hornbills. It was then that the conservation message really hit me."
– Bokato Muru –

Background: The case study site is located in the mountainous state of Nagaland in Northeast India, bordering with Myanmar. The communities in Nagaland have full ownership of the land, which is unique in India. Faced with the destructive way of hunting and fishing practised in recent years, the people of three villages (Sükhai, Kivikhü and Ghükhüyi in Zunheboto district) have taken a bold decision to protect parts of their land from hunting, and use them as the nucleus of alternative livelihood sources based on ecotourism. Around this activity, new scientific information is generated and social infrastructure is being developed.

Sustainability challenge: Despite its rich natural forested landscapes, the local biodiversity in Nagaland in Northeast India is threatened by hunting, tree felling and habitat destruction through reduced fallow shifting cultivation (or "*jhuming*"). Hunting is an important part of the culture of Naga people; as one Naga man told us, "we, the Nagas, eat everything that moves". Species such as the hornbill are iconic in Naga attire and folklore. The local tribe of Sumi traditionally used a variety of traps and snares to hunt. However, guns and destructive fishing practices, such as dynamite and electric currents, replace traditional hunting methods today. This has led to alarming declines in wildlife to the point the Naga people themselves notice empty forests and degradation of their culture by their own actions.

Jhuming is a traditional land use which was sustainable in that the land produced sufficient agricultural produce for families without external nutrient inputs in rotation cycles as long as 15-30 years. Due to increasing village population sizes, cultivation now occurs in shorter rotational cycles (half the traditional duration or

Co-benefit SDGs



Yoji Natori (Akita International University and Conservation International Japan). **Pia Sethi,** (Centre for Ecology, Development and Research – CEDAR). **Siddharth Edake** and **Yatish Lele** (The Energy and Resources Institute – TERI).

less).[1] The losses of productivity in crops, forests and soil erosion have become major sustainability concerns.

Conservation solution: In Nagaland, traditional conservation and wise-use practices helped protect biodiversity over the centuries.

The revival of traditional conservation practices through the creation of Community-Conserved Areas (CCAs) offers hope for conservation, as communities set aside parcels of forests within productive, jhum landscapes.

To ensure the future of Nagaland's CCAs and thereby its biodiversity, a multi-pronged approach has been taken, which includes alternative livelihood opportunities through the development of wildlife ecotourism, legal recognition, ecological restoration and ecological monitoring.

The villages of Sükhai, Kivikhü and Ghükhüyi in Zunheboto district of Nagaland have respectively established CCAs and brought them together to jointly establish the Tizü Valley Biodiversity Conservation and Livelihood Network (TVBCLN). A total of 939 ha of forest are protected by revived traditional resource management methods. TVBCLN decided to ban any form of hunting, tree felling, collection of non-timber forest products and destructive forms of fishing in the CCAs. They also worked with the state government to have the CCA formally recognised, so that administrative support becomes available. The village councils went beyond CCA boundaries and banned hunting and destructive fishing in all land within their territory, totalling 3,751 ha.

Researchers from The Energy and Resources Institute (TERI) helped villagers to build a biodiversity database of the area.[63] Members of village youth have been trained in wildlife photography and videography so that they can document the wealth of local biodiversity. A WhatsApp group provides a platform for them to share the photos and videos and for experts to correctly identify the species and to archive the information. The feedback from the experts creates incentive for the youth to continue the biodiversity documentation activities and improve their skills, while the database is updated at the same time. As of 2019, 222 species of bird, 31 species of reptile, 11 species of amphibian, 200 species of butterfly and more than 200 species of moths have been recorded.

The National Biological Diversity Act 2002 mandates the preparation of People's Biodiversity Registers (PBRs). The villages prepared Nagaland's first three with the support of TERI researchers. The production of PBRs is significant as they are a documentation of traditional ecological knowledge from an oral culture. These publications have become not only great sources of information on biodiversity and traditional knowledge and practices, but also the references for other communities to follow, as well as a pride of the community. They also act as a starting point for access and benefit sharing arrangements for the local people.

Two of the CCAs of Sükhai and Ghükhüyi have CCA patches that comprise abandoned *jhums*. In the case of Sükhai, many of the village people do not have the time to *jhum* in distant areas of the forest. Some of the village people, for example, use cars to reach farm sites, but the more distant areas are permanently abandoned back to forest. Population size of the village is dwindling as people move out; hence smaller *jhumed* areas are probably sufficient for meeting people's agricultural needs. Moreover, following the start of community conservation, the people are now cultivating each *jhum* patch for three years instead of just two (Ivan Jhimo, personal comment).

Measures put in place at CCAs to support conservation and sustainability objectives include:[64]

- Useful skills and knowledge for ecotour guides are being built through the training of youth in photography and videography and through the access to expert feedback from online platforms. [SDG 4; Target 4.4]

[1] Though there is some evidence that jhuming may be reducing and/or occurring closer to villages as populations migrate out.

- CCA regulations protect a stretch of the Tizü river to restore the freshwater ecosystem. [SDG 6; Target 6.6]
- CCAs contribute to preservation of the Naga culture and natural heritage of Nagaland. [SDG 11; Target 11.4]
- Ecotourism revenues contribute to those who are economically disadvantaged. [SDG 10]
- Protection of forest contributes to climate change mitigation as forests here store carbon, estimated at 120.77tC/ha. Besides TVBCLN, there are 407 CCAs in Nagaland, 82 per cent of which, covering more than 1,700 km^2, enforce conservation regulations including logging bans. TVBCLN as a model can lead the work of REDD+ in India (North-eastern states account for 25 per cent of India's forest cover). [SDG 13]
- CCAs directly contribute to conservation of terrestrial ecosystems. [SDG 15; Targets 15.1, 15.2, 15.4, 15.5, 15.7]

Key benefits to sustainability: Article 371A of the Indian Constitution respects Naga's customary laws and processes, and traditional rights, including land ownership, are fully protected. Village councils have full control over how to manage their land. Thus, all decisions regarding the CCAs are made by TVBCLN which also has members of the Village Councils on board. Decisions are discussed regularly in village meetings so that the entire community knows what is happening. PBR preparation, participatory planning and mapping generated awareness and ownership of CCA activities.

Alternative livelihood means that compensating the lack of income by giving up hunting is a priority for TVBCLN. The village people are developing nature and cultural ecotourism. Due to the remoteness of the site (7-hour drive from the nearest airport on rough terrain), it is intended, at least for now, for committed ecotourists. Nonetheless, an increasing number of ecotourists are attracted to the site for its diversity of birds and butterflies, scenic views, cultural practices and the presence of rare species. The biodiversity monitoring, which is an important aspect of CCA management from the ecological perspective, also enriches the ecotourism experience. Villagers trained in wildlife documentation through the monitoring activities function as ecotourism guides. Youth, women's groups and the marginalised members of the community reported increases in their household income including through the sale of traditional products and handicrafts. The protection of a stretch of the Tizü river provided by the CCA has increased the fish catch downstream.

Interaction with ecotourists increases the villagers' ecological awareness, and further leads to better management of common resources, such as *jhum* practices. The conservation initiative has also spurred additional related livelihood activities including the sale of local produce from homestead gardens, handicrafts and the learning of new skills such as pebble art.

Lessons learned: The creation of community-conserved areas generated benefits not just for biodiversity, but also in livelihood and cultural aspects. The involvement of communities, through local champions and stimulating local initiatives, has been key for successful mainstreaming of nature in sustainable development and enhanced awareness of sustainability.[65]

- If communities are well-informed and empowered, they can take steps to protect their natural resources and use them judiciously.
- Having local champions is key to give thrust to the initiative and for the communities to own it. This also leads to rapid spread of such conservation successes and sustained motivation.
- Providing the right incentives is critical. Developing working, alternative conservation-linked livelihoods is the lifeline of conservation initiatives that incur financial burdens. A platform that motivates stakeholders to participate facilitates the impact of capacity building activities to last and expand.
- Tapping into traditional knowledge and drawing upon the rich cultural traditions and biological heritage of local communities gives them a sense of pride in their heritage and enhances conservation outcomes. Documentation of the PBR by Sükhai village was an excellent entry point for enhanced conservation

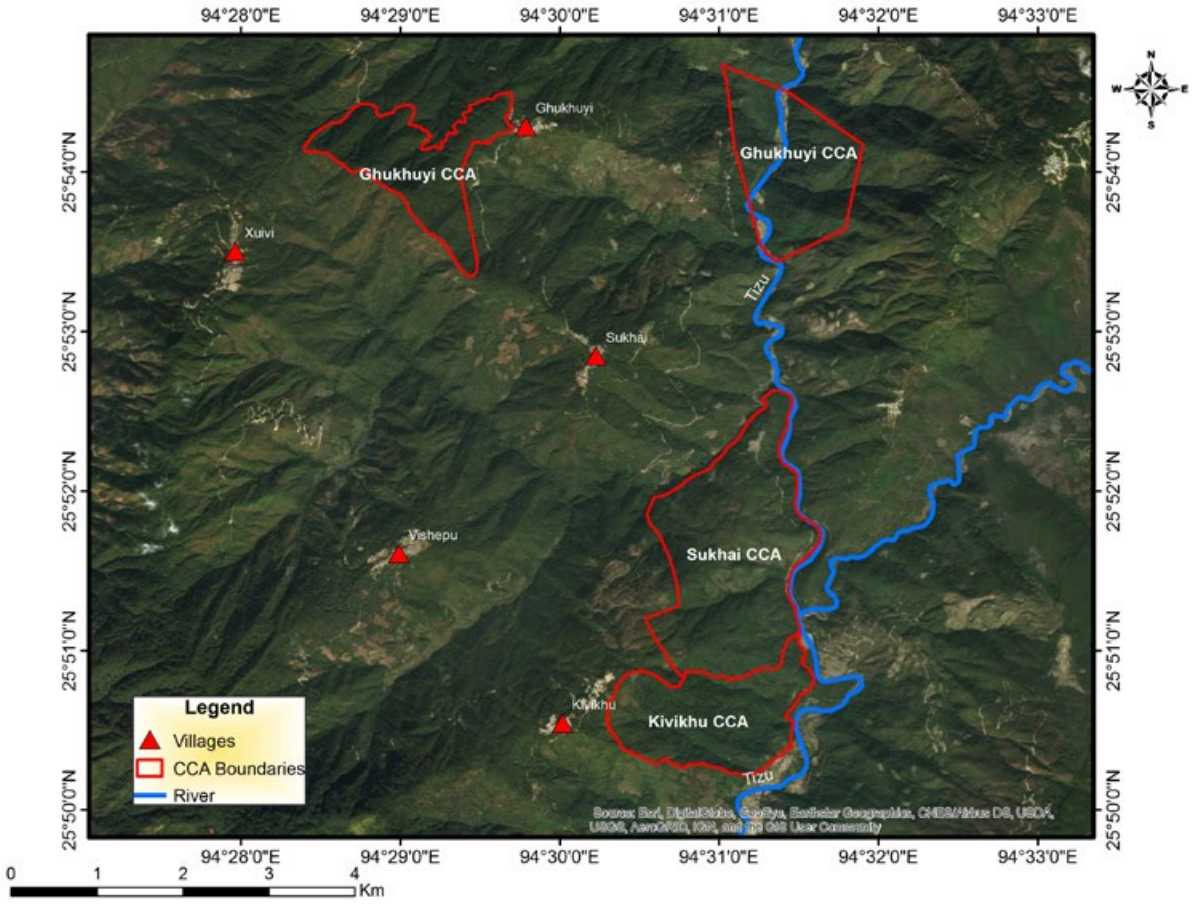


Figure 11.3. Boundaries of the Community Conserved Areas discussed in the case study.

activities. All the neighbouring villages wanted to document their biodiversity too.

- A good conservation success story can work as a model for other communities to emulate leading to the spread of such activities.
- Conservation can be at the nucleus of related livelihood activities. The people are now tapping additional local entrepreneurial opportunities on a small scale.
- Cohesive social capital and active local institutions promote speedy decision making and ensure community support and involvement.

Next steps: Local communities interact across the landscape depending on interlinked resources. The health of one community, therefore, depends on well-functioning ecosystems across the landscape. In particular, the TVBCLN depends on the Tizü river, but while they protect their stretches of the river, other villages use batteries and destructive fishing methods. At the same time, neighbouring villagers and outsiders illegally hunt in the network's landscapes. Therefore, the next steps are to expand conservation education activities amongst villages across the landscape. Creation of People's Biodiversity Registers is required across villages so that the rich tribal knowledge is documented at the earliest. The marketing of ecotourism is to be strengthened so that the ecotourist footfall is enhanced. In the future, two steps are urgently warranted a) tapping into PES mechanisms such as REDD+ and others and b) developing access and benefit sharing opportunities based on PBRs.

Information linked to this case study can also be found through the PANORAMA initiative.

Combining conservation and cultural tourism to support local livelihoods

Blue and John Crow Mountains National Park, Jamaica

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"The work of managing the Blue and John Crow Mountains National Park and World Heritage site has consistently been focused towards the preservation and promotion of the cultural heritage of the Maroons, in conjunction with conservation of the flora and fauna of the site. The Jamaica Conservation and Development Trust (in collaboration with the Government of Jamaica), continues to lead in this, with a focus on sustainable use of the national park and World Heritage site through local community engagement, promotion and support of cultural heritage through training, festivals and employment, all of which redound to the benefit of Maroon and other local communities."

– Debra-Kay Palmer, Director, World Heritage and Cultural Conventions, Ministry of Culture, Gender, Entertainment and Sport, Jamaica –

Background: The Blue and John Crow Mountains National Park established in 1993 is 41,198 ha and protects rain and cloud forest on the central ridge of three mountain ranges in eastern Jamaica. Within 2 km of its boundary, there are about 50 rural farming communities with a population of just over 52,000. Three of these (Moore Town, Charles Town and Scotts Hall) are formally recognised Maroon communities with their own leadership, maintaining the traditions of the escaped, enslaved Africans who mixed with the first peoples of the island, the Taino. The way the Maroons used the mountains, streams, flora, fauna and natural landscape to secure their freedom and sovereignty from British colonial powers in 1740 is recognised in the inscription of the Core Preservation Zone of the National Park as a World Heritage site in 2015. The main recreation area "Holywell" is located just 25 km from Jamaica's capital with a population of almost 1 million. Kingston is a UNESCO Cultural City recognised particularly for its music including reggae and dancehall.

11 SUSTAINABLE CITIES AND COMMUNITIES

Co-benefit SDGs

8 DECENT WORK AND ECONOMIC GROWTH

10 REDUCED INEQUALITIES

13 CLIMATE ACTION

15 LIFE ON LAND

Susan Otuokon (Jamaica Conservation and Development Trust).

Case study

Sustainability challenge: Many of the rural communities around the park are shrinking and cultural heritage is being lost due to migration of youth to cities, seeking employment as there are very limited income-generating opportunities in their communities. Consequently, in order to keep Maroon communities alive, there is a need to find attractive and viable means of livelihood for people in the area. There are also issues with unsustainable land management practices around the park area undermining both conservation efforts and long-term sustainability of local communities. While the park has proven to be a significant contributor to sustainability (see below), funding for its management is limited as the Government of Jamaica provides only about 30 per cent of recurrent operational expenditure and other more general support through relevant agencies. In addition, through a co-management agreement, the non-government organisation manager (Jamaica Conservation and Development Trust – JCDT) is allowed to retain user fees collected at the two recreational areas – Holywell and the Blue Mountain Peak Trail. Funds are needed for ongoing community outreach, particularly aimed at changing land management practices to more environmentally sustainable ones, for restoration of degraded lands and enforcement of related legislation.

Key benefits for sustainability: The National Park safeguards and promotes the cultural heritage of the Maroons of Jamaica, intrinsic to which is their reverence for the mountains as the fortress which supported their ancestors' successful freedom fight and as the burial ground for many of those who lost their lives. Furthermore, the National Park protects rich biodiversity including the unique Greater Antillean broadleaf cloud forest that also provides water and green space for the Greater Kingston Metropolitan Area.[66]

Conservation solution: Tourism and recreation as well as educational opportunities for students have been identified as a way to address the above challenges.

A range of activities have been initiated by the park to promote tourism and related livelihoods in the area. Celebrating nature and culture have long been part of management of the Blue and John Crow Mountains National Park. Aside from the involvement of Maroon communities, formal celebrations started in 2000 with the first hosting of Misty Bliss – a cultural festival at Holywell in honour of the anniversary of the designation of the National Park. Maroon drummers and dancers have always been a major part of the entertainment package along with the sale of traditional food and craft – from the Maroon and other communities. A music festival featuring reggae and other music genres was held at Holywell in 2014 and 2015. The Kongkongkraba (Abeng) Symphony was performed by the Immaculate Conception High School Symphony Orchestra at Holywell in 2018 to celebrate the 25th Anniversary of the National Park. In addition, Park management supports the festivals of the Maroon communities – helping to seek sponsorship and promote the events. JCDT is working with Maroon communities and those near to the National Park's recreation areas to build their capacity for tourism and hospitality through planning, training and marketing.

These events and the newly established Discovery Centre help promote Maroon heritage and build pride in their contribution to the protection of the forests of the Blue and John Crow Mountains. This has led to an interest in visiting Maroon communities thus helping their tourism businesses to grow. Since the promotion of Maroon heritage through the Park's events and more so since the World Heritage site inscription, Maroon communities have seen increased visitation. Young, local entrepreneurs, in particular, have been able to organise guided tours and a tour company which helps ensure income generated remains within the communities. In addition, recreation and tourism are an important source of funding for the park, especially as the organisation can retain legislated user fees and any other income earned at recreation areas (e.g. for guided tours, accommodation and events).

At the same time, JCDT aims to keep the user entry fees low enough to keep access inclusive. Schools are targeted for educational tours and with a recent change in school curricula, there has been an upsurge in demand. Despite this,

Kongkongkraba Symphony at Holywell celebrating Maroon heritage and the Blue and John Crow Mountains.

few inner-city and local, rural community schools were found to be visiting and since 2019, a partnership has been formed with a private sector foundation to support the participation of 10 schools/year from these low-income communities.

Lessons learned: Although the populations of Kingston and St Andrew, who are potential visitors to Holywell, are at least 300,000, the site has only about 16,000 visitors per year, mainly Jamaican residents. This indicates a need for enhanced marketing and transportation improvements. Cultural events in the natural setting of Holywell attract a new public who have never been to the site and this leads to subsequent visits to enjoy nature and learn about cultural heritage. Promotion of Maroon heritage on the National Park's website and through events and the new Discovery Centre has increased visitation to Maroon communities and hence business opportunities particularly for the young who are willing to learn new skills and livelihood options.

Next steps: As income from the National Park's Recreation and Tourism Programme is used for the operation of the recreation areas and management of the wider National Park, support for marketing is a challenge. JCDT involve volunteers to assist with social media and other promotions and used the 5th Anniversary of the World Heritage site inscription in July 2020 to highlight the significance of the site and encourage visitation to the National Park and Maroon communities.

This case study was prepared by the Executive Director of the JCDT who was the Manager of the National Park until August 2019.

Information linked to this case study can also be found through the PANORAMA initiative.

Case study

Evolving management of protected areas as a solution towards a resilient eco-city

Cham Island Marine Protected Area and Hoi An Biosphere Reserve, Vietnam

Chu Manh Trinh, Research and International Cooperation Division, (Cham Islands Marine Protected Area).
Ashley Hollenbeck, Executive Director, (Institute for Village Studies).

Co-benefit SDGs

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"Effective management should come from the people. Without the people, the Cu Lao Cham Marine Protected Area and Hoi An Biosphere Reserve will not be successful because they oversee a large geographic territory, which makes it impossible for them to understand the unique context of each local area. Through asset-based community development, people can combine science with their own knowledge about the place where they live and create strategies to promote conservation and socio-economic development."

– Farmer, Thanh Dong Organic Garden –

Background: The Vietnamese government began to work on Cham Island in 1999 to conserve dwindling fish populations. To overcome tensions between conservation efforts and local fisheries, key stakeholders worked together between 1999 and 2005 to create a co-management framework that included government officials, scientists and local people. As a result, the Cham Island Marine Protected Area (MPA) was created in 2005 with the long-term objectives to (i) protect natural resources and cultural and historical values of the Cham archipelago, and (ii) stimulate socio-economic development.[67]

The success of conservation initiatives implemented by the MPA led the neighbouring city of Hoi An to be nominated by UNESCO as a World Biosphere Reserve in 2009. This status recognised the city's unique relationship with the Thu Bon estuary, and its reliance on local mangrove, seagrass and coral reef habitats. People in this area have always lived in harmony with nature and implemented sustainable livelihood practices. To hold the UNESCO World Biosphere Reserve certificate, Hoi An city had to adopt global criteria that included requirements on ecological and biodiversity conservation together with environmentally friendly economic development.[68]

Geographically, Cham Island now falls under the jurisdiction of Hoi An city, and the Cu Lao Cham and Biosphere Reserve Management Board oversees both areas; the Vice-Chairman of the Hoi An People's Committee plays a crucial role in coordinating activities between the two sites. The creation of the Biosphere Reserve necessitated innovative mechanisms to manage natural resources and the distinct heritage of the region, while simultaneously encouraging continued economic growth through ecotourism and livelihood development.

Cam Thanh is the name of one commune in Hoi An city that lies in the Thu Bon river mouth and is upstream of Cham Island (Figure 11.4). It includes 100 ha of nypa palm mangrove forest and is an ecological buffer zone for Cu Lao Cham Island and the Hoi An Biosphere Reserve. This unique habitat is home to approximately 10,000 people who rely on fishing, aquaculture, agriculture and tourist services for their livelihood. A plan to manage this sensitive ecological system was set up in 2015-2020 and included substantial participation from local people, conservationists, government managers and the private sector.

Figure 11.4: Map depicting Cam Thanh Commune and the UNESCO Biosphere Reserve in relation to the Cham Island Marine Protected Area.[70]

Sustainability challenge: Previously successful strategies to manage natural resources and support local community livelihood needs on Cham Island were not directly transferable to the wider context of Cam Thanh and the Biosphere Reserve. The region has struggled to confront new environmental stressors from a dramatic increase in tourism, including erosion, increased solid waste and wastewater in Hoi An that is carried to the island via Cam Thanh and the Thu Bon river mouth ecosystem. These challenges have been exacerbated by commercial fishing and private sector investment in the area.

The limitations of the MPA co-management structure became obvious in 2013-2016 when government staff adopted a well-intended but narrow-scoped approach to managing land

crabs as an indicator species on the island. Despite its success at facilitating community-based environmental management on Cham Island, this issue-based approach only presented one solution to a multifaceted problem. It did not transcend geographic boundaries between Cham Island and the Cam Thanh nypa palm habitat. It also became clear that the community did not have the capacity or power to direct private sector actors that were having a more substantial impact on local ecosystems than farmers and fishers.

In response to growing tensions and rapid environmental degradation, the MPA organised the first-ever multi-stakeholder dialogue in Vietnam between the government, scientists, private sector and local citizens on marine management and conservation.

Conservation solution: The above realisation encouraged the MPA to move beyond narrow and hierarchical management approaches authored by scientists and experts and implemented by local government and community actors. By prioritising the opinion of the professional class, these approaches consistently lacked funding and resources to implement global "best practices".

Furthermore, during the aforementioned dialogue, it quickly became apparent that involved stakeholders already knew about the problems; they did not, however, have a feasible, locally-based solution to mitigate ecosystem stress.

As the environmental impacts from tourism and development continued to multiply, it became clear that a new approach was needed to protect critical habitat, better engage the local stakeholders and demonstrate that conservation measures could promote socio-economic development.

In 2017, the MPA began to use asset-based community development (ABCD) as a part of their co-management structure to harmonise the relationship between conservation, livelihood improvements and socio-economic development. The goal was to overcome the shortcomings of issue-based approaches that by themselves may undermine resilience, discount local knowledge and create a culture of dependency in communities.[69] Instead of engaging scientists to write the Nypa Palm Forest Ecosystem Management Plan for Cam Thanh, the MPA and Biosphere Reserve staff developed an array of activities and trainings utilising the teachings of ABCD. Over time,

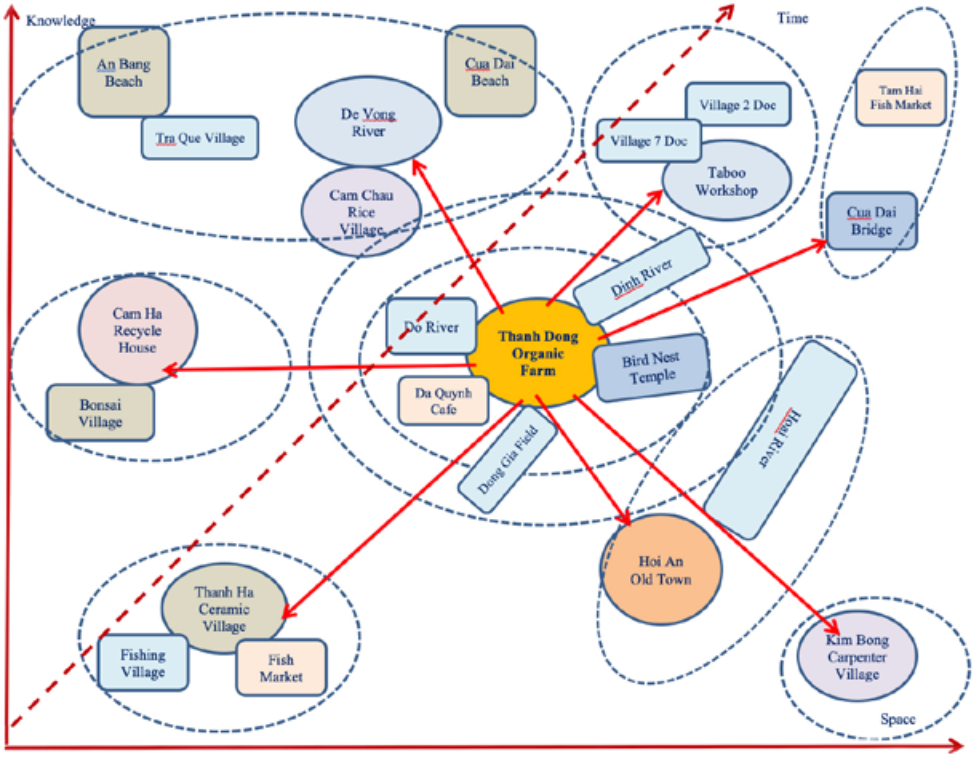

Figure 11.5: Asset map created by farmers at Thanh Dong Organic Farm in 2017 that serves as a guide when showing visitors the region.

Year	Study / Research Visits (Person)	Tourist Visits (Person)	Total (Person)	Entrance fees (Million VND)	Conical boat fees (Million VND)	Total Income (Million VND)
2017	1,116	592	1,708	16	61	337
2018	1,245	1,110	2,355	38	92	495
2019	2,361	1,702	4,063	55	152	439
Total	**4,722**	**3,404**	**8,126**	**109**	**305**	**1,271**

Table 11.1: The number of tourists and student visitors taking part in community workshops on ABCD, and the associated income from entrance fees and conical boat tours from 2017 to 2019 in the Thanh Dong Organic Garden, Cam Thanh, Hoi An, Quang Nam, Viet Nam.

local people became active participants in MPA initiatives in Cam Thanh and better understood their relationship to Cham Island.

For example, one aspect of the management plan was to ensure that farmers will have adequate resources and income to support their livelihood. When farmers began to look at the Thanh Dong Organic Farm already in operation as an asset central to their livelihood, they were able to create an asset map and identify critical linkages to surrounding areas (Figure 11.4). Through a process of co-production, farmers worked together to identify significant geographic sites and local stories and built their own capacity to be tour guides for visitors to the area. Instead of simply answering survey questions for scientists to better understand the local community and ecosystem, they became the primary agents to facilitate change and support the management plan.

Today farmers lead community workshops with students and visitors on conservation and livelihood development through the lens of organic agriculture using the asset-based community development approach they learned from MPA staff (Table 11.1). Their efforts have had an exponential impact; in 2017-2019, the Thanh Dong Organic Farm was able to host 4,722 researchers and students from around the world. In total, this has contributed an additional 1,271,000,000 VND (approx. 49,100 EUR) to their income, a substantial increase in three years.

By combining an issue-based approach with ABCD and working directly with local community members, plans for conservation and socio-economic development have become a reality. The Cam Thanh Commune recently implemented an education campaign to encourage residents to say no to pesticides and fertilisers because they now see the unique value of the organic farm. In allowing local community members to take the lead through ABCD, others have been more receptive to the MPA and Biosphere Reserve's advice on conservation and livelihood development. Instead of focusing primarily on private gain, many now see the importance of public goods to improve their quality of life. Adopting the ABCD approach in community engagement processes has built greater trust within the co-management frameworks in place that are fundamental to the success of the MPA and Biosphere Reserve.

Lessons learned: Ecosystem services should be recognised in the management of the Cu Lao Cham Marine Protected Area Management Plan, as well as for the Hoi An city tourism development. However, this is impossible without understanding the relationship between communities and their environment. Therefore, capacity building should focus on local people as the first priority when planning and carrying out conservation and livelihood building initiatives. ABCD methodologies have proven to be an instrumental tool to ensure these activities reflect communities where desired policy and programme implementation is to take place. Through the "learning by doing" approach inherent in ABCD, stakeholders can build the trust necessary for the commitment it takes to ensure conservation and socio-economic development programmes are successful.

Case study

Cham Island
Vietnam

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Next steps: Partnerships have been the main objective for the Cu Lao Cham Marine Protected Area and Biosphere Reserve since conservation efforts were introduced in 1999. The next step in this process will be building a network of communities from the Cu Lao Cham islands to Cam Thanh and eventually up the Thu Bon river to include traditional villages in Hoi An, such as Tra Que Vegetable Village, Cam Kim Carpenter Village and Thanh Ha Ceramic Village. These are all tourist centres and have a substantial impact on downstream ecosystem health.

Local farmers who have become teachers in Thanh Dong Organic Garden in Cam Thanh have expressed an interest in creating a Community School to increase their capacity. Future students may include more people from neighbouring villages, which will be the first step in expanding the community network to harmonise the relationship between conservation, livelihood improvements and socio-economic development.

Information linked to this case study can also be found through the PANORAMA initiative.

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SDG 16: Peace, justice and strong institutions

Summary for policy makers

SDG 16 aims to address the above challenges in multiple ways, several of which are explicitly linked to effective area-based conservation. It strives to reduce all forms of violence and related death rates across the world (Target 16.1), including significantly reducing illicit financial and arms flows and combating all forms of organised crime (Target 16.4) such as those linked to illegal wildlife trade. To underpin this, SDG 16 strives to ensure responsive, inclusive, participatory and representative decision-making and effective, accountable and transparent institutions at all levels of governance (Targets 16.6, 16.7 and 16.A).

Protected and conserved areas can support peaceful and inclusive societies by helping to maintain environmental stability and human security. This applies to situations both during and after conflict. In an ideal situation, sustainable management of the natural environment and resources can help to prevent conflicts flaring up in the first place, with protected and conserved areas as key tools, functioning as a safety net for resource supply and providing a framework for good governance and security. Economic opportunities provided by effective area-based conservation regimes (e.g. wildlife tourism) can also play a key role in providing alternatives to illegal trade in wildlife and other natural resources. In general, many protected areas with effective management are areas of good governance, control and law enforcement in areas otherwise subject to conflict and insecurity.

Conflict prevention: By maintaining the ecosystem functions and related benefits (e.g. food, fuel, water, natural medicines), area-based conservation can help to minimise risks of conflicts during periods of unrest and/or resource scarcity.

Conflict mitigation and resolution: Area-based conservation can also be part of conflict mitigation strategies, with protected and conserved areas contributing to basic human wellbeing (e.g. sources for livelihood) and with protected area frameworks and structures helping to retain a certain level of governance and cooperation in conflict areas.

Post-conflict rebuilding: In the aftermath of conflict, protected areas can help to increase social cohesion and bring back economic opportunities to communities and provide governance structures for the sustainable use of land and resources into the future. For example, the concept of Peace Parks has proven an effective means to support transboundary peace-building in post-conflict situations.

What is the challenge?

The Global Peace Index, responsible for assessing trends in global peacefulness for over a decade, shows that global peacefulness – captured through the number and severity of ongoing conflicts, extent of societal safety and security, and militarisation – has deteriorated by 3.5 per cent since 2008.[1] These conflicts together with an increase in criminality are directly undermining many SDGs around the world.[2]

Further to the above, the effects of climate change pose a major challenge to peacefulness in the coming decade,[3] creating a vicious circle within the 2030 Sustainability Agenda. Climate change and resource scarcity ranked as the highest global risks by the World Economic Forum in 2019,[4] with climate change indirectly increasing the likelihood of violent conflict through its impacts on resource availability, livelihood security and migration. In 2017, over 60 per cent of total global displacements were estimated to be due to climate-related disasters.[5]

Looking into the future, the 2019 Global Peace Index cites that 41 per cent of people (400 million) living in areas with high or very high exposure to climate hazards reside in countries with low levels of peacefulness. Furthermore, eight of the 25 least peaceful countries have 10 per cent or more of their population in high climate hazard areas, amounting to over 100 million people at risk.[1] Regionally, sub-Saharan Africa has the weakest coping capacity for climate hazards while the Middle East and North Africa have the highest water-related risk levels, with over 90 per cent of river catchments at medium to extremely high risk of water stress.

Serious civil unrests and armed conflicts are usually bad news for nature.[6] The rule of law collapses, providing opportunities for illegal use of natural resources, both by criminal gangs and by impoverished or displaced people who are faced with few other options for subsistence.[7] For example, the Rwanda genocide sent thousands of people walking through protected areas to reach safety across national borders, killing animals for food and clearing trees along the way.[8] Conflict situations also divert resources away from conservation efforts, most extremely in countries where nature conservation relies on the involvement of armed forces. For example, the Maoist insurgency in Nepal meant that troops guarding rhinos and tigers were moved to other duties, leading to a spike in poaching.[9]

Long-term conflict can also lead to depressing development and emptying areas of people, thus halting land use change as, for example, in large areas of the Colombian Amazon.[10] However, if not carefully addressed, in these situations environmental damage can rapidly escalate post-conflict when access to land is regained.[11] While nature commonly finds itself at the receiving end of – or sometimes as a driver for – disputes and conflicts, the natural environment and good governance of natural resources and ecosystems can play an important role in peacebuilding and preventing conflicts.[12, 13]

SDG 16 aims to address the above challenges in multiple ways, several of which explicitly linked to effective area-based conservation. It strives to reduce all forms of violence and related death rates across the world (Target 16.1), including significantly reducing illicit financial and arms flows and combating all forms of organised crime (Target 16.4) such as those linked to illegal wildlife trade. To underpin this, SDG 16 strives to ensure responsive, inclusive, participatory and representative decision-making and effective, accountable and transparent institutions at all levels of governance (Targets 16.6, 16.7 and 16.A).

How can effective area-based conservation help?

Protected and conserved areas have a role to play in building peacefulness and cooperation, by supporting livelihood security and wellbeing before conflict breaks out, and by actions both during conflict and in the process of rebuilding trust and institutions following a serious outbreak

1 South Sudan, Iraq, Libya, the Democratic Republic of the Congo, Sudan, North Korea, Nigeria and Mexico.

of unrest. In general, effective area-based conservation inherently involves a certain degree of conflict management, including management of expectations and consensus building among diverse stakeholders. The tools commonly employed in the context of conservation (e.g. stakeholder engagement, collaborative consensus building and benefit-sharing schemes) are applicable both in achieving long-term conservation but also for maintaining and creating peaceful and prosperous societies.

Conflict prevention: By maintaining the ecosystem functions and related benefits, area-based conservation can help to reduce resource scarcity, increase human security and minimise related risks of conflicts. Protected areas are also sometimes the cause of conflict with local communities. Here we focus on the positive benefits, whilst acknowledging that disbenefits can also arise. Conservation areas contribute directly to food and water security, disaster risk reduction and by providing safe places to exercise and relax,[14] thus helping to reinforce domestic security. For example, in Djibouti, the Day Forest Reserve protects one of the last areas of native forest in the country and is of prime importance to biodiversity, but it also provides a source of food for local people during periods of drought.[15] In Cambodia, Tonle Sap lake, a biosphere reserve provides 60 per cent of the country's freshwater fish catch, providing vital food to local people.[16] Natural disaster risk reduction can help to mitigate the impacts of – and support recovery from – natural hazards, preventing them becoming full-blown natural disasters with long-lasting impacts.[17] For example, research shows that coral reefs can dissipate wave energy by 97 per cent, protecting coastal communities from storms and tsunamis,[18] while mangroves protect inland rice crops from cyclone damage.[19] Finally, and on the more fundamental level, the world's protected area system plays a significant role in climate mitigation through its carbon storage and sequestration functions.[20]

Conflict mitigation and resolution: Protected areas can also be part of conflict mitigation strategies, underpinning access to resources and providing frameworks and structures to maintain a certain level of governance in conflict areas. Effective area-based conservation regimes can also play a key role in both regulating and providing alternatives to illegal trade in wildlife and other natural resources, this way also limiting financial flows that are known to feed back into conflict situations.

In situations of conflict within or between countries, protected area staff are often some of the few government employees to remain in disputed areas. In these cases, they can find themselves in the position of unofficial go-betweens, occupying a grey area between a militarised state and rebel forces, and negotiating even at times when the state is not negotiating officially. This has happened many times during the long-running conflicts in Colombia for instance. Such cooperation occurs in international conflicts as well; gorilla experts in Ugandan and Congolese protected areas continued collaborating whatever the relations between the two countries. Sometimes protected area governance structures can also play a more active role in addressing conflict, by maintaining law and security in areas where other government institutions are failing.[21]

There is often considerable overlap between insurgence and poaching and rangers address both, for example in Zakouma National Park in Chad,[22] and Garamba National Park in the Democratic Republic of Congo.[23] Such issues affect non-state protected areas as well. For example, one of the key motivations for local people to form the conservancies of northern Kenya has been to improve security and reduce cattle theft.[24]

The security crisis in the Central African Republic has seen a dozen armed groups and multiple local militias usurp control of most of the country.[25] The Chinko Wildlife Refuge, a 50-year public-private partnership involving the Central African Republic's Environment Ministry and the African Parks network with support from USAID and the Walton Family Foundation, is bringing some security to 1.8 million hectares of otherwise lawless territory.[26] Chinko is the largest employer in the region, providing jobs for some 400 local people, and additionally funds dozens of nurses and teachers. In 2017, 380 Internally Displaced People, mainly women

and children, fled to Chinko seeking sanctuary from civil unrest and were protected by the rangers.[27] While the situation is not ideal, i.e. conservationists are not trained at either security or humanitarian aid, in practice it is far from rare.

Post-conflict rebuilding: In the aftermath of conflict, protected and conserved areas can help to bring back economic opportunities to people who may have lost everything. In consequence, protected areas and OECMs can be used as "safe spaces" for development with existing examples around the world from former Yugoslavia to the Congo Basin. The Norwegian aid agency Norad funded a three-year project to increase cooperation between protected area managers across the new national borders of the former Yugoslavia.[28] The use of REDD+ projects in community forests adjacent to protected areas is seen as a way of helping to rebuild peace in the fragile political situation existing in the Democratic Republic of Congo.[29]

Rwanda had a catastrophic civil war in 1994, with the deaths of a million people. The country is small and crowded, with most land used for agriculture, yet the government has prioritised its national park system to attract high-paying foreign tourists. Gorilla tourism virtually disappeared from 1994-98, but has boomed since; by 2008, there were 20,000 visits to protected areas of which 17,000 were for gorilla viewing,[30] and growth has continued. Tourism earned Rwanda US$400 million in 2016[31] and US$438 million in 2017,[32] making it the largest earner of foreign exchange, with gorilla permits costing US$1,500 each. However, research suggests that economic benefits have not substantially trickled down to the local communities and tensions (including poaching) remain,[33] highlighting the need to embed conservation within wider social goals.

Any institution involved in management of protected and conserved areas needs to adopt human rights-based approaches in order to avoid human rights violations "in the name of nature". Lastly, and more subtly, bringing actors together through nature conservation can be an important part of nation-building in itself.[34] For example, in places where the military get directly involved in management, protected areas provide an opportunity to build a different role for army and navy personnel and a different relationship with civil society. Such links carry risks – in the past the army has been closely involved in large-scale poaching in places such as Madagascar and Thailand for instance and militarisation of conservation can increase domestic conflict.[35] But if well-managed it can provide positive role models in other places, bringing new actors into an understanding of conservation. The role of the navy in protecting marine reserves in Colombia would be one such example. By providing a peaceful, positive example of cooperation, well-planned and managed protected areas can thus both prevent and help the recovery from armed conflict within nations.

Tools that support SDG 16

Since area-based conservation often inherently involves managing tensions between different approaches to land use and reconciling views of diverse stakeholders, it follows that conflict management and consensus building among diverse stakeholders are at the centre of conservation work. Tools such as stakeholder engagement, collaborative consensus building, benefit-sharing schemes and a range of approaches to the resolution of human–wildlife conflict are essential not only for achieving long-term conservation but also for creating peaceful and prosperous societies. Conservation organisations have certainly not always been successful in addressing conflict. But successes and failures have both provided lessons and there are opportunities to use these skills in a broader context.

All types of effective area-based conservation with a good governance structure and engagement with local stakeholders can contribute to the implementation of SDG 16. As this chapter shows, existing examples of such contributions range from state-managed protected areas to conservation areas managed directly by local communities. As with SDGs 10 and 5, conservation areas based in cultural landscapes or around the principle of sustainable use (e.g. IUCN protected area categories V and VI) might be amongst the most suitable to provide

a holistic, multi-use management regime yielding the most effective outcomes. In any case, it is important to underline that area-based conservation can only be an element in the broader strategic approach to maintaining peacefulness or resolving conflict situations in an area. However, there are specific types of protected areas, OECMs and other area-based management approaches that can help:

- **Peace parks**: Are those parks established specifically with the aim of helping peacebuilding after a period of national or international insecurity and conflict and are transboundary protected areas stretching across a national or regional border. The philosophy of Peace Parks is that working to protect natural habitat and species can be a non-confrontational set of actions that can provide a bridge between communities that may have been in conflict, mutually suspicious, or separated. Peace Parks can celebrate peace and help promote peace following conflict. The first recognised Peace Park was designated between Canada and the United States, the Waterton-Glacier International Peace Park, designated as a celebration of the long peace between the two countries. Other parks aim to build peace, such as the Cordillera del Condor between Ecuador and Peru, established after the brief border conflict of 1995.

- **Demilitarised zones (DMZ):** DMZs seem unlikely conservation sites, but they are often amongst the most highly protected places on the planet and many have high biodiversity values in consequence. The DMZ between Kuwait and Iraq for example, in place since the first Gulf War, contains some of the healthiest dryland ecosystems in Kuwait, with very limited grazing and a gradually restoring vegetation ecology. Similarly, rich habitats are found in DMZ between North and South Korea, with a proposed Peace Park looking towards an easing of tensions between these two countries.[36] Future recognition of DMZs as protected areas or OECMs is one way to both help secure the sites and provide them with a wider purpose than simply military defence.

Case study

Collaboration for conservation delivering peace and improved regional security

Northern rangeland community conservation areas, Kenya

Co-benefit SDGs

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Sophie Harrison (Northern Rangeland Trust).

"With new businesses to grow, we're too busy to fight, and we've got more to lose if we do."
– a young warrior in the Northern rangelands –

Sustainability challenge: In the harsh environment of northern Kenya, pastoralist communities have long struggled with ethnic conflict, marginalisation, sparse government services and landscape-level insecurity, particularly elephant poaching and livestock theft. This has not only disrupted and destroyed lives, but hindered development too.

Kenya's northern rangelands are home to about 10 semi-nomadic ethnic groups, almost all of whom have cultures, traditions and livelihoods deeply rooted in rearing, herding and marketing livestock. They share their rangelands with a diverse array of wildlife, including lion, giraffe, buffalo and elephant. Historically, illegal elephant poaching for ivory (for which there is mounting evidence to suggest links to terrorism funding) and large-scale livestock theft have run rampant, exacerbated by easy access to illegal firearms and a lack of law enforcement capacity to curb it.

Ethnic tensions and the often-associated stock theft in this landscape have complex and longstanding roots. At the same time, the traditional tribal governance structures best placed to navigate these issues have often struggled to adapt to a changing social and political climate.

Conservation solution: A grassroots community conservation movement is spreading in Kenya, helping to build effective, accountable and inclusive local institutions, which are nurturing more peaceful and more inclusive societies for sustainable development.

This new movement is starting to drive real and significant transformation in Kenya's north, united by umbrella organisation the Northern Rangelands Trust (NRT). In the past ten years, the number of NRT-member community conservancy institutions has grown from 18 to 39. Collectively, they now manage over 4.4 million hectares of land, for the purposes of transforming lives, securing peace and conserving natural resources.

NRT receives core funding for community conservancies from USAID, The Nature Conservancy, DANIDA, the EU and many others.

Close to 800 community scouts, employed by community conservancies, now work alongside law enforcement to increase security for both wildlife and people, and elephant poaching for ivory has reduced by 96 per cent since 2012 as a result. Hundreds of young men previously caught up in frontline conflict and stock theft are turning to enterprise and entrepreneurship, funded by their conservancies. And 76 Peace Ambassadors across the landscape are helping to build a collective culture of dialogue and non-violent conflict resolution.

Key benefits to sustainability: Promoting inclusive societies for sustainable development

Target 16.7 of SDG 16 aims to ensure responsive, inclusive, participatory and representative decision-making at all levels, with one of the indicators being the "*proportion of population who believe decision-making is inclusive and responsive, by sex, age, disability and population group*".

In Kenya, a community conservancy is defined as a community-based organisation created to support the management of community-owned land for the benefit of improving livelihoods. They are legally registered institutions, governed by a locally elected board and run by a local management team, which includes various sub-committees such as grazing, peace, finance and tourism.

Where multiple ethnic groups live in one conservancy area, the board must be ethnically representative. The inclusion of women on boards and management teams is a growing priority for conservancies, and although progress is slow (at present, 8 per cent of conservancy managers are women), conservancies are now receiving specialist support for gender mainstreaming and developing culturally appropriate solutions to ensure that all conservancy members and leadership – regardless of their gender – are able to fully participate in, and benefit from, natural resource conservation efforts and livelihood activities.

Inclusive governance – a story from Lower Tana Delta

In 2013, violent tribal clashes between the Orma and the Pokomo tribes in Lower Tana, north-eastern Kenya, resulted in the death of approximately 1,000 people. This inspired the establishment of the Lower Tana Delta Conservancy, as a platform for inclusive dialogue and reconciliation.

Although the board of the Conservancy was supposed to be representative, just two members from the Orma community were listed, and never turned up to board meetings for fear of their lives. The Conservancy sought support from NRT's peace team, made up of people who were familiar with the area and its socio-economic complexities. Two years of talks ensued, involving tribal elders, conservancy leadership, religious leaders, local government and law enforcement. In 2015, Lower Tana Delta held their first democratic elections, electing a 50/50 representative board.

Increasingly, community conservancies are providing the institutional entry point for donor and County Government livelihoods and development support. This is a game changer – for the first time, communities are democratically identifying and steering development projects to where they are needed most – rather than development projects being steered by donor agendas.

Building peace for a prosperous future

The direct impact of conservancy-driven peace programmes is hard to quantify. Yet in a 2017 social survey conducted across NRT member conservancies, 74 per cent of respondents said they felt safer as a result of their conservancies, and 68 per cent said they felt security was improving. Peace forms the stable foundation for livelihoods development, wildlife conservation and land restoration programmes, for which there is certainly anecdotal evidence, and now growing quantified data.

Case study

Community conservancies enable a mutual and respectful forum for dialogue between different ethnic groups – NRT member conservancies focus their peace programmes on facilitating the engagement of community peace ambassadors, interfaith religious leaders, youth and women with county and national government agencies in addressing ethnic and natural-resource based conflicts. Over 8,000 people participated in peace meetings in 2019.

The cross-conservancy Peace Ambassadors initiative involves 76 men and women from selected member conservancies, who are supported to promote non-violent conflict resolution amongst their peers, provide information on planned livestock raids, and help coordinate return of stolen livestock in order to prevent retaliatory attacks.

The role of women in peace building is being enhanced overall with a greater emphasis on bringing women into peace dialogue and developing their strengths in building peace. Engagement of youth in peace is also critical and is being achieved through sports-for-peace events, widespread raising of awareness among youth and herders on the need for peace, and working with youth leaders from different ethnic groups to spearhead peace-building in their communities.

Enterprise has a part to play in peace building too. In 2019, 741 people accessed vocational training through their conservancies, and US$284,000 was dispersed as business loans through conservancies for 803 entrepreneurs. With poverty one of the underlying drivers of conflict, community conservancies are finding that boosting sustainable, Indigenous economies is as valuable as any other direct peace-building intervention.

However, while progress is being made across much of the landscape, conflict and theft continues to occur in certain hotspots, exacerbated by resource conflict during increasing periods of drought. NRT and the conservancies work closely with the Kenya Wildlife Service (KWS), Kenya Police, local government authorities and others to support a community-led approach to policing.

Target 16.4 of SDG 16 aims to significantly reduce illicit financial and arms flows and strengthen the recovery and return of stolen assets and combat all forms of organised crime by 2030. The evidence that NRT is contributing to this is compelling.

Each NRT member conservancy employs a team of uniformed scouts (there are 791 across the landscape) from the local communities, who play a vital role in monitoring endangered wildlife species, conducting anti-poaching patrols, raising conservation awareness in their local communities and acting as community wildlife ambassadors. Many conservancies are home to multiple ethnic groups, and all have equal representation in the scout teams – whose efforts have contributed to a 96 per cent reduction in elephant poaching for ivory since 2012.

Alongside conservancy scouts, NRT employs six mobile scout teams who operate on a regional level under the National Police Service and KWS, focusing primarily on anti-poaching and mitigating livestock theft, when called upon by the government. The mobile teams represent the ethnic diversity of the communities they serve, and this is one of their greatest strengths. Working to improve security for both wildlife and people, they are not only crippling the ability of criminal poaching syndicates (often thought to be linked to terrorist networks) to operate, but they are helping to take illegal firearms out of commission, and curb stock theft.

50 per cent of all livestock reported stolen in NRT member conservancies in 2019 were recovered and returned to their owners through collaboration between community conservancies, the mobile scout teams and government. This would have been unthinkable a few years ago and helped prevent a high number of retaliation attacks.

Building effective, accountable and inclusive institutions at all levels

Target 16.6 of SDG 16 aims to develop effective, accountable and transparent institutions at all levels, judged by the proportion of the population satisfied with their last experience of public services.

Peace meeting in progress.

NRT has recognised that improved peace and security are only possible with strong institutions. To complement and strengthen traditional governance systems, NRT have invested in a bespoke Leadership and Management Programme, adapted from use in corporate companies to suit Indigenous institutions; some of which have a largely illiterate board. Since it launched in 2016, 450 people have taken part in the programme, which is proving transformational in building Indigenous capability for transparent, effective governance systems able to deal with a rapidly changing social, environmental and political landscape.

NRT member conservancies have increasingly strong partnerships with County Government, who are starting to see these grassroots institutions as effective entry points through which to deliver their public services and development mandates. There has been US$1.6 million of County Government investment in conservancies since 2014, supporting infrastructure and equipment for conservancy management, and supplies and expertise for conservancy-built health clinics, for example. Policy support for community conservancies is increasing too, strengthening land tenure rights, public support, and financial security for conservancies.

Lessons learned and next steps: In conclusion, an Indigenous and collaborative approach to conservation in northern Kenya is helping to deliver the targets of SDG 16 through effective, accountable and inclusive community conservation. It shows, however, that peace, justice and strong institutions are mutually inclusive of other sustainable development goals: poverty reduction, good education, growing enterprise, gender equality, improved wellbeing and better wildlife and habitat conservation, and that this holistic approach to new-era African conservation is the way to ensure impact is delivered in the right way, at the right time, by the right people.

Case study

Parks & Peace: Strengthening peace in Colombia through inclusive conservation

Alto Fragua Indiwasi National Park and surrounding municipal protected areas, Colombia

Co-benefit SDGs

Julia Gorricho, South America Project Officer, (WWF Germany).
Markus Schultze-Kraft, Arnhold Associate Fellow, (Georg Eckert Institute for International Textbook Research – Member of the Leibniz Association, Braunschweig, Germany).

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'When you work on biodiversity conservation, you work not only on restoring biodiversity, but also on rebuilding social fabric in the regions.... That is, exalting local leaderships, promoting political empowerment and the mobilization of women, strengthening local capacities, and negotiating and building a common vision of a territory. All these elements are at the centre of what we think is required to build peace'

– Environmental NGO expert, Colombia, 2016 –

Background: Over a period of more than 50 years, Colombia suffered the western hemisphere's longest-standing internal armed conflict producing a huge humanitarian toll: some 260,000 people were killed and more than six million were forcibly displaced.[37]

In this setting, Alto Fragua Indiwasi National Park was established on 25 February 2002, just four days after President Andrés Pastrana (1998-2002) ended another round of unsuccessful peace negotiations with FARC, Colombia´s largest guerrilla group, which had taken place in a demilitarized zone in Caquetá and Meta. The park is in the southern piedmont of the Colombian Amazon in Caquetá, a region heavily affected by violent conflict for many years. It covers 74,555 hectares and is named after the headwaters of the Fragua River and the indigenous term Indiwasi (House of the Sun).

The park is in a region considered to be one of the world's top biodiversity hotspots[38] due to the convergence of three of the earth's centres of high diversity, that is, the biogeographic Chocó, the Andes and the Amazon. It also harbours sacred areas of unique cultural value for the Ingano indigenous people where medicinal plants such as yage (Banisteriopsis sp.) and yoco (*Paullinia yoco*) grow. In short, the creation of the park was the first attempt in Colombia to establish a protected area in indigenous ancestral lands with ´biocultural´ conservation objectives.

The dynamics of the armed conflict in Caquetá and the national park are deeply interwoven with the region's booming coca and drug trafficking economies dating back to the early 1980s, when coca crops were first introduced in Caquetá. As a result, significant numbers of impoverished farmers were attracted from other parts of Colombia to this remote agricultural frontier region. Harsh counter-drug measures implemented by the Colombian government (with US support) did little to stem the illegal cocaine industry in Caquetá and other southern and south-western regions of Colombia. Both illicit crops and government counter-drug strategies represent major threats to the conservation of the Alto Fragua Indiwasi National Park.[39]

Sustainability challenge: Access to land is one of the root causes of violence and conflict in Colombia. Specifically, land tenancy and use-related conflicts in and around protected areas represent a significant threat to biodiversity conservation. Around 30,000 small landless farmers live on, and occupy or use land in, 37 national parks (out of a total of 59). Caught up in a condition of vulnerability farmers engage in different types of economic activities, including illicit coca farming, that significantly contribute to deforestation inside national parks.

When the Alto Fragua Indiwasi Park was established, Caquetá was a main theatre of the Colombian armed conflict. For the Ingano

indigenous community and the National Park Team (NPT) the conflict posed serious challenges. Ingano leaders were threatened by a host of armed actors (insurgents, paramilitaries and the state's military). This critical situation accelerated the loss of Ingano traditional culture. Likewise, amid violent conflict the NPT saw their administrative capacity undermined. From the onset, management of the park was thus a high-risk activity. The presence of armed groups, especially FARC, limited the capacity of the team to access and work in certain areas in and around the park. Mobility restrictions and bans on public meetings imposed by paramilitaries, among other armed groups, also restrained the activities of NPT and the Ingano community.

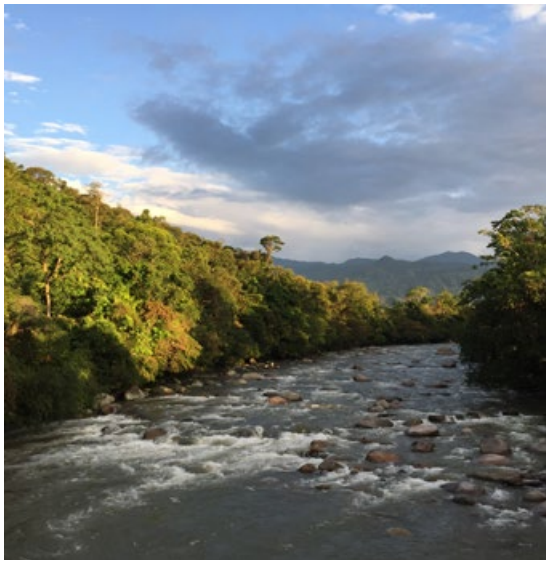
Illicit crops too became a big threat to park management.[40] By 2007, "almost all farmers in the southern slope of the national park cultivated coca" (Interview, NPT member, San José, 2016). In addition to the destruction of forests through deforestation and ecosystem fragmentation in and outside the park, the presence of illicit crops and its associated dynamics, that is, armed disputes for the control of drug-related activities in the area, aerial and manual government efforts to eradicate coca crops and peasant strikes, all but undermined the NPT's authority and power for managing the protected area. The park director had no control over complex issues related to illicit crop farming inside the protected area. The crops belonged to the farmers but were controlled and subsidised by non-state armed groups, such as FARC and paramilitaries, who provided supplies and bought the harvested coca leaves at the farm gate.

Conservation solution: A peace agreement with FARC was finally signed in 2016, over a decade after the establishment of the Alto Fragua Indiwasi National Park. However, many post-conflict challenges lie ahead in Colombia. Human rights, justice, democracy, development and security must be strengthened and reinstalled without putting the country's mega biodiversity at risk. WWF supports the Government of Colombia in the quest for strengthening peacebuilding and conservation efforts by providing strategies aimed at involving local communities in conserving biodiversity through improving their living conditions and promoting the peaceful resolution of land-related conflicts around national parks.

In Alto Fragua National Park, the promotion of conservation agreements with local farmers has been an effective strategy to strengthen protected area management while simultaneously providing solutions to resolve the historical occupation and use of protected area land by small farmers, this way supporting their livelihoods. This has been achieved through a conservation approach focused on creating inclusive institutions for biodiversity conservation.

Resolving issues associated with land tenancy and disputes over natural resource use in national parks in post-conflict settings requires an inclusive conservation approach that recognises the rights of local communities and defines their role in conservation; foments participation of communities in government planning; trains leaders in advocacy so they can effectively articulate and defend their rights, needs, and interests; and makes financial and non-financial benefits visible for all stakeholders, while guaranteeing a healthy flow of benefits to communities.

Alto Fragua is a good example of the implementation of the inclusive conservation approach. NPT has focused on developing partnerships with local NGOs, such as Tierra Viva, to be able to achieve conservation results during war and postconflict. Tierra Viva, a community-based conservation initiative in the municipality of Belén was



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founded by locals in the 1990s to keep the municipality's rivers and parks clean. Soon the members realised that more effective watershed management resulted in improved quality of drinking water, thereby reducing the occurrence of common diseases like diarrhoea. With the support of Belen's mayor's office, they decided to declare several local protected areas in the municipality and its surroundings (Interview, member local NGO, Belén, 2016). By 2002, the year Alto Fragua Indiwasi was declared a National Park, the foundation administered nine municipal protected areas. Although most of these areas are not adjacent to the park (only one is in the buffer zone), this community-based conservation initiative has made significant contributions to enhancing conservation efforts at the landscape level, positioning Tierra Viva as an important partner.

One of the salient aspects of the Tierra Viva process has been that it is entirely led by members of the local community who stayed in the area throughout acute armed conflict. Successfully managing nine protected areas with NPT´s technical support, Tierra Viva achieved that all relevant stakeholders, including paramilitaries, guerrillas, government armed forces and local communities, would recognise and respect its conservation mandate. Key to this has been involving members of local communities in programmes and working closely with public agencies in the region, such as the regional environmental authority, the environment attorney and the environment prosecutor. This enabled a degree of control over activities inside the protected areas, including illicit coca growing. Today "*there are no illicit crops grown in our protected areas*" (Interview, member local NGO, Belén, 2016).

The Tierra Viva initiative is a good example of how local conservation institutions can become more cohesive during war. Continuing with this initiative despite the difficulties posed by armed conflict and postconflict has been uplifting for members of the foundation and has given them a reason to live through hard times. In the words of one local stakeholder, "*preservation of local protected areas was our own way of defending life in the midst of war. We did it because we love this place and we did not want to leave. Thus, we had to be brave to do whatever was needed*" (Interview, member local NGO, Belén, 2016). Until today, Tierra Viva has actively protected a total of 70,110 hectares in the municipality of Belén. This area represents 59 percent of the municipality´s area and is almost equal to the area of the national park.

On top of the conservation results achieved by Tierra Viva, perhaps the main outcome of this initiative has been the empowerment of local communities during armed conflict. "*Tierra Viva made people aware of the importance of the environment. Today, we feel proud about our territory and its abundant natural resources. This initiative empowered our community and gave us reasons to defend our territory, reasons to stay, reasons to be creative and resist violence, reasons to build peace in this territory*" (Interview, member local NGO, Belén, 2016).

Lessons learned: During times of armed conflict and transition to peace, conservation approaches need to be adjusted to achieve conservation results without impacting negatively or worsening a very complex and polarized context. As the case of Alto Fragua Indiwasi shows, an inclusive conservation approach can actually contribute positively to different aspects of peacebuilding by rebuilding social fabric in the regions, exalting local leaderships, promoting political empowerment, strengthening local capacities, building a common vision of a territory and promoting the peaceful resolution of conflicts through dialogue.

Next steps: WWF and the government of Colombia will upscale this approach through the implementation of the "Parks & Peace" project, funded by the German Government, in six national parks, including Chiribiquete, the largest tropical rainforest national park in the world (4.2 million ha). This project will provide strong cases and lessons learned to influence policy debates at the national level regarding the sustainable use of biodiversity within protected areas, as well as the peaceful transformation of land-related conflicts in Colombia.

Conservation, sustainable development and peace work in a war zone

The Salween Peace Park, Myanmar

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Co-benefit SDGs

Nigel Dudley, (Equilibrium Research and IUCN WCPA).

Background: Myanmar has suffered from decades of internal political and religious tension, first under the military dictatorship and continuing under a more civilian government. In particular sections of the Karen society, a local Indigenous group, have conducted a long-running insurgency, virtually since independence in 1948, aimed at establishing a separate state.[41] This has long been financed by logging,[42] as has the military,[43] and by opium production, which continues at a high level in the north of the country.

Despite the long-term problems, the area has some of the richest biodiversity in Southeast Asia, yet this is under growing pressure and poorly surveyed. The first structured camera trap survey of the region found high numbers of mammal species,[44] and a field survey in part of the area found a large number of endangered mammal species, including the Asiatic black bear (*Ursus thibetanus*), sun bear (*Helarctos malayanus*), eastern hoolock gibbon (*Hoolock leuconedys*), dhole (*Cuon alpinus*), Sunda pangolin (*Manis javanica*), Chinese pangolin (*M. pentadactyla*) and great hornbill (*Buceros bicornis*), along with several previously unidentified plant and animal species.[45]

Sustainability challenge: Despite efforts to reform the timber industry,[46] widespread illegality continues,[47] and is facilitated by widespread corruption at high levels.[48] Hydroelectric projects upstream threaten the integrity of river systems, destroy forests[49] and also have the ability to create additional conflict as they are strongly opposed by local communities.[50] Throughout Myanmar, unsustainable fuelwood production degrades forest areas.[51] The Karen remain vulnerable, subject to repression and politically isolated. While some protected areas exist, they have long been hampered by lack of resources and capacity,[52] and recent assessments suggest that these challenges remain in many places. Local communities are wary of a government-declared protected area in the region, which they think will

Case study

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remove more of their rights, and prefer a self-declared and self-managed conserved area.[53]

Conservation solution: Local communities, supported by the Karen Environmental and Social Action Network, have long advocated sustainable livelihoods linked to greater local control of land and water. Community forestry has been introduced,[54] along with implementation of fish conservation zones.

An endogenous proposal for a peace park in the region was developed over several years, based around the core aspirations of the Karen people: (i) peace and self-determination, (ii) environmental integrity, and (iii) cultural survival.[55] The park is aimed at maintaining forest cover, retaining water governance and also protecting biodiversity and cultural and sacred sites in the region. The Peace Park aims to secure important areas of forest in a near-natural state, to provide wildlife conservation and help to mitigate and adapt to climate change,[56] and to provide sustainable management of the remainder to ensure a steady supply of goods and income, and manage water resources sustainably. The Peace Park is recognised as an ICCA – ICCAs are "territories or areas conserved by Indigenous peoples or local communities", or just "territories for life".

During 2016 and 2017, a Peace Park interim committee of community representatives and the proposers of the park held a series of meetings with over 5,000 local inhabitants in three townships and 26 village tracts. The principle of Free, Prior and Informed Consent (FPIC) was critical to this process. Communities identified the impacts of the long-term conflict and discussed the governance structures needed to build an equitable and long-lasting peace. The

Salween Peace Park Charter emerged from these meetings and passed with the endorsement of 75.1 per cent of the voting-age population. The Charter was launched at the December 2018 event, and is now known locally as the Peace Park constitution.[57]

In December 2018, Indigenous people in the region came together to declare a 5,485 km² Salween Peace Park. The area is not empty; it includes 340 villages in 27 village tracts, 139 demarcated *kaw* (customary lands, covering 1,062 km²), 27 community forests (110 km²), four forest reserves (180 km²) and three wildlife sanctuaries (540 km²). Delineation of the zones has been coordinated with Karen government officials and the regional authority.[58] Active forest restoration is taking place, with an annual tree planting day and other initiatives.[59]

Sustainability measures in place: There is strong community support for the initiative, although broader political processes continue to put the area at risk. Since the beginning of 2020, and particularly during the general chaos of the pandemic, the Myanmar military has been very active in the region, villagers are reported to have been killed and hundreds have fled into the forest,[60] and the army has been felling trees within the Peace Park.[61]

Lessons learned: The agreement and establishment of the Peace Park was a major achievement in an area where conflict has been endemic for 70 years. Long-term engagement, a participatory and democratic approach and the willingness to take time to reach understanding demonstrate that progress is possible even in the most unpromising conditions.

Next steps: The fragility of the area is of deep concern, and the Myanmar military is still obviously intent on extending control through the area; self-declaration is important but does not secure the area if it is ignored by more powerful players. The villagers are caught in the middle of what must seem like an endless war that has already lasted beyond most of their lifetimes and shows no real signs of declining despite the peace process, which has clearly stalled. Other problems in Myanmar, including the huge upsurge of violence against the Rohinga and a military coup, have diverted attention both domestically and internationally. Greater recognition of the ICCA is important at international level, to maintain pressure on the government to honour the wishes of the local communities. The next few months and years are critical to the survival of the Peace Park and its values.

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Part C
Call for action

Towards using effective area-based conservation as a tool for delivering the sustainable development goals

Summary for policy makers

Effective area-based conservation has a key role to play in delivery of a wide range of SDGs, in addition to those explicitly linked to biodiversity conservation. We encourage governments, companies, communities and others to integrate area-based conservation into their SDG plans, and to draw on the benefits derived from protected areas and OECMs when reporting progress on the SDGs.

Full use of protected and conserved areas as tools for SDG delivery includes four key steps:

- **Recognition** of the wider SDG targets addressed by effective area-based conservation
- **Integration** of these values so for instance "other" values do not unwittingly undermine the conservation aim
- **Enhancement** of the relevant values through adding to the network and through management approaches
- **Reporting** of these as a contribution to the SDGs

We also call on existing international processes, including the CBD, UNCCD and UNFCCC along with UN agencies and bilateral and multilateral donors, to give more explicit recognition of these roles in their reporting mechanisms and project objectives.

4. Conclusions

The central aim of this book has been to demonstrate that effective area-based conservation has a key role to play in delivery of a wide range of the Sustainable Development Goals, to encourage reflection of this in international processes and targets, and to encourage governments and others to draw on the benefits derived from protected areas and OECMs when reporting progress on the SDGs.

We have drawn on a rich, existing literature on protected and conserved areas as natural solutions[1] and nature-based solutions[2] and on the need to reflect these within the SDGs.[3] This includes much thought about how to integrate area-based conservation into the Nationally Determined Contributions of the UN Framework Convention on Climate Change;[4] the Land Degradation Neutrality targets of the UN Convention to Combat Desertification;[5] and the post-2020 targets of the Convention on Biological Diversity. In the latter case, it needs to be noted that the initial inputs from the OECD on indicators are only considered in SDGs 14 and 15.[6] The need to reflect "non-biodiversity" SDG goals within the framework was noted by many CBD Parties.[7]

Protected and conserved areas can thus add significantly to SDG delivery, which is currently failing to keep up with the agreed targets, and this in turn will strengthen the position of area-based conservation. Those responsible for area-based conservation need to make the case as well, whether they are managers or rangers in state protected areas, involved in territories and areas conserved by Indigenous peoples and local communities, owners of privately protected areas, or one of the multitude of government, commercial or community interests responsible for OECMs.

Full use of effective area-based conservation as a tool for SDG delivery includes four key steps:

- **Recognition** of the wider SDG targets addressed by area-based conservation
- **Integration** of these values into national SDG development strategies
- **Enhancement** of the relevant values through management approaches, if possible
- **Reporting** of these as a contribution to the SDGs

Each of these will be examined briefly below, and some summary guidance given.

Recognition of the wider SDG target addressed by area-based conservation is at the heart of this report. The role of protected areas as tools for delivery of ecosystem services has been recognised and increasingly stressed over the past twenty years. While there are many individual examples of successful use and recognition of the contribution of protected and conserved areas to socio-economic benefits, the issue has still not fully come to scale,[8] and there is further work still needed to convince many of those outside the conservation field that these values are tangible and realisable.
It is also important not to over-claim. Protected and conserved areas have a major role but are seldom the sole solution to a particular challenge, whether the challenge is biodiversity conservation, climate mitigation or maintaining water security. Furthermore, the delivery mechanisms for ecosystem services often remain partial or incomplete: many of the PES and REDD+ schemes that are often associated with protected areas have under-delivered[9] and each relative failure undermines a handful of successes. Clear and transparent valuation, ways of measuring benefits and techniques for maximising wider benefits are still needed. Managers and supporters of protected areas and OECMs can help, but a wider discourse with industry and government is urgently needed.

Area based conservation can contribute in some measure to virtually all the SDGs,[10] but the strongest links are to those SDGs outlined

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Thomson Nature Park in Singapore

in this report. These are summarised in Table 4.1 as a checklist that can be used in individual initiatives and examples are given in Tables 4.2-4.4 below.

Integration of ecosystem services into sectoral policies and strategies is very important. Most countries have civil servants responsible for addressing the Sustainable Development Goals, and civil society organisations providing a watchdog role on these issues. A protected area agency or an NGO can provide welcome support for this process, which often fails to meet its targets, by supplying positive examples and management options. Furthermore, it is important to ensure that protected and conserved areas are included in policies related to delivery of ecosystem services rather than simply within reporting processes, to ensure that these sites are also eligible for any support packages associated with SDG delivery.

Integration is also important at a site level as part of the management. Poorly thought-out approaches can have perverse results through leakage (simply transferring a problem somewhere else, like protecting one forest at the expense of another) or because efforts to achieve one benefit undermine others. A narrow focus on ecosystem services could unwittingly damage other values. For example, reforestation schemes on natural grassland or savannah undermine these important ecosystems and can also lead to net carbon loss. The forthcoming UN Decade on Ecosystem Restoration will need to be carefully implemented to avoid such paradoxes, particularly in OECMs, which are new and where policies are still being developed.

Within protected areas, integration needs to be addressed by answering two fundamental questions, applicable to any actions not directly associated with nature conservation: does the contribution to other SDGs reduce the ability to fulfil SDG 14 and/or SDG 15 as appropriate, and could future efforts to enhance the contribution to other SDGs reduce the ability to fulfil SDG 14 and/or SDG 15 as appropriate?

For OECMs, the situation is slightly more confusing, because many will not have nature conservation as a management priority, with conservation values ancillary to other objectives. But once an area has been declared an OECM, there is an expectation and a

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commitment that nature conservation values will be maintained, so the same two questions remain applicable.

Enhancement is important, notwithstanding the caution outlined above. Enhancement can come in two ways: first increasing the area under conservation management, and secondly increasing the number and/or value of ecosystem services within these areas. There have been multiple arguments for increasing protected areas and OECMs, and also recognition that existing networks are failing to include many areas that deliver important ecosystem services,[11] such as important carbon storage areas. Delivery of ecosystem services – of the wider SDG values – can provide important arguments and justification for expansion and for both restoration activities in protected areas and for developing restoration initiatives in putative OECMs. For instance, actions like coastal mangrove restoration, coral reef rehabilitation, restoration of forests on steep slopes and floodplains, rewilding rivers and dryland revegetation programmes can all provide mutual benefits for biodiversity conservation and disaster risk reduction. Many other examples have been summarised in the previous pages. But in the current context, clear guidelines about the type of enhancement fit for delivery of particular SDGs would also be useful.

Reporting contributions to the SDGs will often seem like an irrelevance or extra burden to those actively involved in day-to-day management but is very important in terms of building support for effective area-based conservation. Table 4.1 could be used as a reporting template for protected areas to report against the SDGs. Using three of the case studies outlined in the book, Tables 4.2-4.4, demonstrate how protected areas and OECMs could report their main SDG contributions.

Table 4.1: Checklist for the (key) contributions of area-based conservation to SDGs

Key SDGs	Main values
SDG 15: Life on land	Biodiversity conservation on land and in freshwater
SDG 14: Life below water	Biodiversity conservation in coastal and marine areas
SDG 1: No poverty	Providing income-generating opportunities to poor people
SDG 2: Zero hunger	Maintaining species collected from the wild, particularly fish
	Supplying ecosystem services (e.g. irrigation water)
	Conserving supportive wild species (e.g. pollinators)
	Stabilising and rebuilding soil and beneficial soil organisms
	Conserving crop and livestock wild relatives
	Cultural ecosystems with traditional agriculture and grazing
SDG 3: Good health & wellbeing	Access to green space
	Improved air and water quality and cooling in cities
	Sources of local and global medicines
	Intact ecosystems forming buffers against certain diseases
	Physical and mental health benefits from recreation, etc.
SDG 5: Gender equality	Supporting gender equality
	Taking steps against gender-based violence
SDG 6: Clean water & sanitation	Improving the quality of water flowing from a catchment
	Increasing the amount of water flowing from a catchment
	Storing water and maintaining flow to avoid floods and droughts
SDG 10: Reduced inequality	Actively promoting social inclusion
	Ensuring equal opportunities
	Inclusive governance mechanisms for ecosystem services
	Access to ecosystem services for disadvantaged in society
SDG 11: Sustainable cities & communities	Disaster risk reduction for urban dwellers
	Improving air quality
	Managing urban reserves as green spaces
	Sustainable livelihoods for communities
	Maintaining biological connectivity in urban areas
SDG 13: Climate action	Disaster risk reduction
	Other ecosystem services to help climate change adaptation
	Storage and sequestration of carbon
	Natural laboratories for assessing impacts of climate change
	Demonstrating impacts of climate change
SDG 16: Peace, justice & strong institutions	Conflict prevention
	Conflict mitigation and resolution
	Post-conflict rebuilding

Table 4.2: SDG report card – example of the case study on urban parks in Singapore (see page 184)

Key SDGs	Contribution to the delivery of SDGs	
15 LIFE ON LAND	**Biodiversity conservation on land and in freshwater**	Although Singapore suffered heavy extinction in the past,[12] the protected areas have largely halted losses and rich biodiversity remains, with new species often recorded.[13] The state is a stronghold for endangered species, such as the Sunda pangolin (*Manis javanica*).[14] Pollution control has resulted in re-establishment of the Smooth-coated otter (*Lutrogale perspicillata*).
14 LIFE BELOW WATER	**Biodiversity conservation in coastal and marine areas**	The Mandai Mangrove and Mudflat is conserved, forming a rare example of successful mangrove conservation in the region and a site of much scientific research and baseline data.[15] 250 species of hard corals, accounting for more than 30% of known global hard coral diversity.
3 GOOD HEALTH AND WELL-BEING	**Improving people's mental and physical health**	The park system is a central feature in Singapore's plans to boost public health through more exercise[16] and better mental health.[17] Therapeutic gardens and nature play-gardens will bring Singaporeans closer to nature. Intensified planting efforts also help cool surrounding areas.[18]
6 CLEAN WATER AND SANITATION	**Improving the quality of water flowing from a catchment**	Bukit Timah and the Central Catchment area were originally protected to maintain water supplies and remain an important source of water security.[19]
11 SUSTAINABLE CITIES AND COMMUNITIES	**Disaster risk reduction for urban dwellers**	Flood mitigation of coastal and riverine areas is being boosted through naturalisation of water bodies.
	Managing green spaces in settlements	A key aim of the parks system is to allow urban dwellers to experience nature even in very crowded conditions.
	Maintaining biological connectivity in urban areas	Ecological connectivity is being enhanced. "Least resistance" pathways are modelled using GIS to plan ecological corridors.[20] Greenery along streetscapes is intensified, resulting in multi-tiered planting replicating the natural structure of forests, known as Nature Ways.
13 CLIMATE ACTION	**Storage and sequestration of carbon**	Through the planting of one million trees as part of the OneMillionTrees movement, an estimated 78,000 tonnes of carbon dioxide will be sequestered.

Table 4.3: SDG report card – example of the case study on the Potato Park in Peru (see page 78)

Key SDGs	Contribution to the delivery of SDGs	
	**Biodiversity conservation on land and in freshwater**	Although much of the area is cultivated, it includes important wild species, and the long rotation time (seven years) leaves large areas untouched at any particular time.
	**Reducing global poverty**	The communities in the park exist mainly outside the cash economy, living by choice mainly through subsistence and barter. Some cash is generated through tourism and sales.
	**Conserving crop and livestock wild relatives**	CWR of potatoes (Solanum spp.) are used to improve cultivated varieties (e.g. for resistance against potato blight).[21] The park is centre of origin of three potato crop wild relatives and supports 1,377 potato varieties, along with 92 other Andean tubers, more than anywhere else. In 2015, the community sent seeds to the global seed storage facility at Svalbard, Norway, providing triple security in the field, on the site and in long-term storage.
	Cultural ecosystems with traditional agriculture and grazing	The Potato Park maintains traditional cultural systems of management, including cultivation of potatoes and other tubers in the high Andes, along with the Quechwa language and spiritual belief systems.
		The park has supported and to some extent extended traditional Quechwa culture, while simultaneously encouraging interaction with modernity, particularly Western science. It provides a viable model to maintain and extend the society in what is otherwise a tough environment.
	**Adaptation to climate change**	The park is adapting potatoes to climate change; community members undertake monitoring and collaborate with agronomists. Native potatoes are more resilient. Warmer weather means more crops (e.g. beans) can be grown and potatoes grown at higher altitudes. But pests are also commoner at lower altitudes, forcing farmers to grow higher. Transects and insect traps measure changes in pests, timing of frost and experiments with calcium additives.

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Table 4.4: SDG report card – example of the case study on the northern rangelands in Kenya (see page 208)

Key SDGs	Contribution to the delivery of SDGs	
15 LIFE ON LAND	**Biodiversity conservation on land and in freshwater**	The area contains important wildlife including lion, giraffe, black rhino, buffalo and elephant, that was previously under threat from human–wildlife conflict and poaching (particularly of elephants).
1 NO POVERTY	**Reducing global poverty**	Loans, support for local agriculture and greater security all help to reduce poverty in the region.
5 GENDER EQUALITY	**Bringing women into the local peace building processes**	The role of women in peace building is being enhanced overall with a greater emphasis on bringing women into peace dialogue and developing their strengths in building peace.
8 DECENT WORK AND ECONOMIC GROWTH	**Supporting local employment**	In 2019, 741 people accessed vocational training, and US$284,000 was dispersed as business loans to 803 entrepreneurs. Communities are also supported in maintaining traditional cattle-rearing.
10 REDUCED INEQUALITIES	**Reducing inter community inequality**	Inter-ethnic tensions, cattle rustling and violent conflict are increased by inequality. By improving everyone's standard of living, the aim is to help reduce these tensions and to bring some security into a previously quite lawless area.
11 SUSTAINABLE CITIES AND COMMUNITIES	**Building sustainable communities**	The focus of the rangelands project is to build sustainable communities within the harsh environment of the region.
16 PEACE, JUSTICE AND STRONG INSTITUTIONS	**Reducing community tensions**	Many of the conservancies are aimed principally at peace building. For instance, in 2013, violent tribal clashes between the Orma and the Pokomo tribes in Lower Tana, NE Kenya, resulted in the death of 1,000 people. This inspired the establishment of Lower Tana Delta Conservancy, as a platform for inclusive dialogue and reconciliation, although it took two years' negotiation to get a balanced and functioning board.

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Our review shows how protected and conserved areas are already helping to achieve the Sustainable Development Goals.
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