PARKS

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IUCN WCPA WORLD COMMISSION ON PROTECTED AREAS

IUCN PROTECTED AREA DEFINITION, MANAGEMENT CATEGORIES AND GOVERNANCE TYPES

IUCN defines a protected area as:
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.

The definition is expanded by six management categories (one with a sub-division), summarized below.

Ia Strict nature reserve: Strictly protected for biodiversity and also possibly geological/ geomorphological features, where human visitation, use and impacts are controlled and limited to ensure protection of the conservation values.

Ib Wilderness area: Usually large unmodified or slightly modified areas, retaining their natural character and influence, without permanent or significant human habitation, protected and managed to preserve their natural condition.

II National park: Large natural or near-natural areas protecting large-scale ecological processes with characteristic species and ecosystems, which also have 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, marine cavern, geological feature such as a cave, or a living feature such as an ancient grove.

IV Habitat/species management area: Areas to protect particular species or habitats, where management reflects this priority. Many will need regular, active interventions to meet the needs of particular species or habitats, but this is not a requirement of the category.

V Protected landscape or seascape: Where the interaction of people and nature over time has produced a 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 and its associated nature conservation and other values.

VI Protected areas with sustainable use of natural resources: Areas which conserve ecosystems, together with associated cultural values and traditional natural resource management systems. Generally large, mainly in a natural condition, with a proportion under sustainable natural resource management and where low-level non- industrial natural resource use compatible with nature conservation is seen as one of the main aims.

The category should be based around the primary management objective(s), which should apply to at least three-quarters of the protected area – the 75 per cent rule.

The management categories are applied with a typology of governance types – a description of who holds authority and responsibility for the protected area.

IUCN defines four governance types.

Governance by government: Federal or national ministry/agency in charge; sub-national ministry/agency in charge; government-delegated management (e.g. to NGO)

Shared governance: Collaborative management (various degrees of influence); joint management (pluralist management board); transboundary management (various levels across international borders)

Private governance: By individual owner; by non-profit organisations (NGOs, universities, cooperatives); by for- profit organsations (individuals or corporate)

Governance by indigenous peoples and local communities: Indigenous peoples' conserved areas and territories; community conserved areas – declared and run by local communities.

For more information on the IUCN definition, categories and governance type see the 2008 *Guidelines for applying protected area management categories* **which can be downloaded at: www.iucn.org/pa_categories**

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IUCN-WCPA's Best Practice Protected Area Guidelines are the world's authoritative resource for protected area managers. Involving collaboration among specialist practitioners dedicated to supporting better implementation in the field, they distil learning and advice drawn from across IUCN. Applied in the field, they are building institutional and individual capacity to manage protected area systems effectively, equitably and sustainably, and to cope with the myriad of challenges faced in practice. They also assist national governments, protected area agencies, nongovernmental organisations, communities and private sector partners to meet their commitments and goals, and especially the Convention on Biological Diversity's Programme of Work on Protected Areas.

A full set of guidelines is available at: www.iucn.org/pa_guidelines
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PARKS is published to strengthen international collaboration in protected area development and management by:

- exchanging information on practical management issues, especially learning from case studies of applied ideas;
- serving as a global forum for discussing new and emerging issues that relate to protected areas;
- promoting understanding of the values and benefits derived from protected areas to communities, visitors, business and others;
- ensuring that protected areas fulfil their primary role in nature conservation while addressing critical issues such as ecologically sustainable development, social justice and climate change adaptation and mitigation;
- changing and improving protected area support and behaviour through use of information provided in the journal; and
- promoting IUCN's work on protected areas.

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PARKS: THE INTERNATIONAL JOURNAL OF PROTECTED AREAS AND CONSERVATION

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CONTENTS

IUCN WCPA TRIBUTE TO DR KATHY MACKINNON (1948–2023)

Kathy and Deputy Chair Julia Miranda on the ferry across to the International Academy for Nature Conservation on Insel Vilm

Penelope Figgis AO, IUCN WCPA Vice Chair for Oceania 2005 – 2021. With thanks to Kathy's family, Karen Richardson, Marc Hockings, Stephen Woodley, Nigel Dudley, Sue Stolton and Trevor Sandwith for assistance in preparing this tribute.

On the 18th March when the family informed the IUCN World Commission on Protected Areas (WCPA) of the sudden loss of our former Chair, Dr Kathy MacKinnon, her three sons recognised Kathy had "a second family in the conservation world and WCPA". The news flowed rapidly across the world to all continents. It shocked and saddened a wide range of people from NGOs, government agencies, rangers in the field, the science community and indigenous peoples and local communities. The conservation community valued Kathy as a devoted, innovative, advocate for the living Earth, its species, protected areas and all conservation efforts globally. While books could, and should, be written on her rich life, the WCPA wishes to focus on her profound contributions to conservation outcomes. Over the last 14 years she offered her immense capabilities to WCPA's global goals which have now been substantially adopted as the world's goals.

Kathy told the story of her childhood living in a mining town near Durham and at an early age hearing about some top school called 'Oxford'. She emphatically announced she would go there. Local teachers recognised her high intelligence and ensured she achieved her goal. In 1976, she received her PhD in Zoology (on squirrels) from Oxford University and spent ten years in Indonesia with then husband Dr John MacKinnon producing major research and publications on tropical ecology, biodiversity and protected areas planning and management, while at the same time raising three sons.

In 1994, Kathy was appointed the Lead Biodiversity Specialist with the World Bank where she found ways to integrate conservation outcomes with economic development. She pioneered the effort to mainstream biodiversity into the Bank's operations using Global Environment Facility (GEF) funding. In that role, she also helped launch the Critical Ecosystem Partnership Fund (CEPF) and supported countless Bank-led GEF projects. The result was the protection of millions of hectares of vital ecosystems across the world. In this role she worked with international and national conservation NGOs as well as government agencies in many developing countries creating a formidable network. The evidence of what such assistance meant to people was visible at any conference where representatives from every continent would enthusiastically hail and embrace her. This impact was also evident in many of the tributes made following her passing.

At the World Bank, Kathy frequently interacted with IUCN and WCPA supporting protected area projects, publications and other knowledge products. In particular, she was passionate about, and supported, the publication of many local language field guides, which stood proudly on her bookshelves next to the many technical documents about integrating conservation in development. David Shepherd who headed IUCN's Programme on Protected Areas for many years says "*Kathy was an enormous supporter of The Commission on National Parks and Protected Areas, the forerunner of WCPA. She was always a source of practical guidance and advice, always able to find, or suggest, avenues of financial assistance to assist in supporting the establishment and better management of protected areas around the world. Kathy was very closely involved in the planning and implementation of the 2003 IUCN World*

Parks Congress and her input and ideas played a major role in the implementation of this landmark Congress."

In 2009, working with several leading organisations, Kathy supported the preparation *of Natural Solutions,* a significant publication that made the case for protected areas and their role in addressing the impacts of climate change. Kathy working with colleagues communicated this perspective into the negotiations that led to the adoption of the Strategic Plan for Biodiversity and its 20 Aichi Targets. Its influence was far reaching. Long term friends and frequent collaborators Nigel Dudley and Sue Stolton commented that the work on natural solutions led to Julia Miranda (then the head of Colombia's protected area system) taking this up in her region, and ultimately led to a declaration from 18 Latin American and Caribbean countries adopting a declaration and commitment on protected areas as natural solutions to climate change. This was presented as part of the negotiations on the Paris Agreement in 2015.

Kathy retired from the World Bank soon after in 2010. WCPA Chair Nik Lophoukine persuaded her to join WCPA's Steering Committee as a specialist on issues related to the Convention on Biological Diversity (CBD). The following 11 years saw Kathy dedicate her immense capacity, knowledge and contacts principally to WCPA while still maintaining senior roles in other international conservation bodies. In 2012 Kathy became a very active and competent Deputy Chair of WCPA, more like a Co-Chair according to the then Chair, Ernesto Enkerlin. She was subsequently elected by the IUCN World Conservation Congress as WCPA Chair and IUCN Council member in 2016 until 2021. Over this period she was also a dedicated member of the World Protected Areas Leadership Forum.

The 2010 – 2021 period was an intense but productive time for WCPA. Its strategy was strongly shaped by the adoption of the Aichi Targets at Nagoya in 2010. Target 11 was of major importance in setting direction for systems of protected and conserved areas that not only represented the most important areas for conserving biodiversity, but highlighted that they also needed to be equitably governed and effectively managed. Under Kathy's guidance, WCPA prepared many important resource documents to support governments and organisations to implement Target 11 across all of its dimensions. Kathy's energetic and inclusive leadership was vital. She became Chair of the CBD's Target 11 Partnership, which spurred efforts across the world to achieve all elements of the Target. The head of conservation in the CBD Secretariat, Sarat Babu Gidda, called Kathy 'his Angel'. The tribute was well deserved

Kathy at the Midori Prize ceremony, Japan, 2018

both for her constant championship of the goals, but also for undoubtedly receiving more calls from Sarat in his profound dedication to achieving the target than any other person. While Target 11 didn't quite reach its goal it achieved a great deal worldwide in protected area growth and the development and application of higher standards of management and governance.

In the decade up to 2020 the Commission's specialist groups and task forces produced globally outstanding products aimed at the implementation of all components of this gaol. Kathy was very active in these groups working closely with IUCN staff led by Trevor Sandwith head of the Global Protected Areas Programme. Kathy and other WCPA experts were constant members and contributors to IUCN's many delegations to the Convention on Biological Diversity. They defined international nature conservation policy and generated key elements of guidance for the CBD in all matters related to protected areas. These included best practice guidelines, technical notes, and numerous articles while piloting and testing training materials. Kathy was deeply involved with most initiatives and was a major presenter of their content at conferences.

She was particularly dedicated to ensuring the WCPA produced high-quality guidance beyond declarations to ensure the equitable governance and effective management of protected areas. A major tool in achieving effective systems of protected and conserved

Two Aichi Target 11 champions, Kathy with Sarat Babu Gidda from the CBD Secretariat

areas is the IUCN Green List Standard initiated first in 2009 by long standing WCPA expert Dr Marc Hockings and adopted by the IUCN Council in 2017 having been launched at the IUCN World Parks Congress in 2014. In Marc's tribute he said *"Her support for WCPA's initiatives on management effectiveness in those early years was pivotal - especially in getting it integrated into the GEF processes that expanded its impact globally. As Chair of the first IUCN Green List Committee she was both a great supporter and staunch defender of the integrity of the Green List Standard."*

In the middle of these already crowded years was the IUCN World Parks Congress 2014 in Sydney Australia. For WCPA it was a huge organisational endeavour, but a great success attracting over 6,000 delegates from 170 countries in Sydney's Olympic Park from 12–19 November 2014. Kathy, then Deputy Chair had a major role as the Chair of the Programme Working Group and member of the International Steering Committee. A large preparatory meeting was held in Cuernavaca, Mexico hosted by then Chair, Ernesto Enkerlin, with many of the world's protected area experts. During the Congress Kathy was a presenter as well as a key organiser and problem solver. The conference led to commitments to take forward the key concepts of modern protected and conserved areas set out in the document *The Promise of Sydney*. These included innovative partnerships, respect and involvement of Indigenous peoples, prioritising important biodiversity areas, ensuring ecological connectivity, advancing equitable and effective governance, building capacity and mentoring of youth, promoting recognition of protected areas as vital to climate change mitigation and adaption and to human health and well-being.

While pursuing the achievement of Target 11, the next step, shaping the post-2020 global biodiversity framework, became WCPA's priority. Kathy was involved in all the work of specialist groups and task forces especially after she was elected Chair in 2016 at the IUCN World Conservation Congress in Hawaii. She particularly worked on defining and guiding the recognition of "other effective area-based conservation measures"(OECMs). This concept laid the foundation for the eventual adoption of the ambitious goal of conserving at least 30% of the world's oceans, terrestrial areas and inland water areas. Recognising the importance of this ambition, Kathy encouraged Harvey Locke, a long-term advocate for major increases in world targets, to create a WCPA Task Force on Beyond the Aichi Targets. Members of this Task Force traveled the world successfully building momentum for the eventual adoption of the Kunming-Montreal Global Biodiversity Framework and its most prominent Target 3 or simply '30/30' which has been endorsed by 190 nations. It is not immodest to say WCPA and the Task Force can take a significant amount of credit for this dramatic global commitment.

Kathy had been honored in 2007 with the Distinguished Service Award of the Society of Conservation Biology and in 2018 the international community was delighted when her life of dedication to conservation outcomes was recognised by the awarding in Tokyo of the prestigious Midori Prize from the AEON Environmental Foundation and Secretariat of the Convention on Biological Diversity. The prize honours individuals who have "made outstanding contributions to the conservation and sustainable use of biodiversity at global, regional or local levels". This honour not only brought credit to Kathy, but also to the IUCN as a whole and was celebrated before 4000 delegates at the CBD COP 14 in Sharm el Sheikh in Egypt in November 2018.

There are numerous contributions and qualities for which Kathy should be remembered, however several stand out. As a person with knowledge and experience

Kathy receiving the the prestigious Midori Prize from the AEON Environmental Foundation, Tokyo 2018

in many areas of the world she was aware of how nations and regions have complex differences of stability, economic and educational capacity and cultural drivers which affect the achievement of conservation goals. She was an enthusiast for regional meetings where people with issues in common could exchange knowledge and form partnerships. She strongly backed the third Latin America and Caribbean Protected Area Congress in 2019 and co-chaired the International Steering Committees for both the Second Asia Parks Congress in Sabah, Malaysia, and the Inaugural IUCN African Protected Areas Congress in Kigali, Rwanda, both in 2022. These major events required a substantial contribution of her time and skills but she was delighted that they were very successful meetings. John Waithaka WCPA Regional Chair for East and Southern Africa and major Congress organiser stated "*Africa mourns her for making history. She fully and enthusiastically supported our efforts to hold the first Africa Protected Areas Congress.*"

Another important commitment was to 'bring in the talent'. She respected long standing and committed experts, but was enthusiastic about bringing in fresh thought and ability. She fostered promising young people who had shown by their study choices and actions that they intended to have a lifelong involvement in conservation. Despite WCPA's very modest resources she always seemed to find some funding to bring young people to major IUCN meetings and was personally a mentor to many. Heather Bingham of the UN Environment World Conservation Monitoring Centre praised Kathy's commitment to the institution as a board member and advisor and added *"On a more personal note, she also recognised potential within our team. Kathy has been a mentor to many of us, nurturing our abilities as young professionals, and supporting us to grow in our roles and develop our networks in the conservation world. She will be deeply missed."*

Kathy also contributed a great deal through her prolific writing. She was the author of over 100 scientific books and publications, including recent books that promote protected areas as proven natural climate solutions. Stephen Woodley, Former Chief Scientist of Parks Canadian and WCPA Steering Committee member, commented *"We worked together on several publications, first writing a Chapter on 'Managing Protected Areas for Biodiversity and Ecosystem Function,' in the now famous WCPA book 'Protected Area Governance and Management' led by Graeme Worboys. We co-published eight other referred papers and were on the writing team of the IUCN-WCPA Task Force on OECMs' technical report on 'Recognising and reporting other effective area-based conservation measures'. Kathy was an unrelenting coauthor and editor in those efforts, always demanding we make it shorter, clearer and simpler."*

'Generosity' is a word used frequently in tributes to Kathy. She was generous with her time, energy, advice, hospitality and her interest in others' views and lives. She was also generous in finding funding, sometimes at her own cost. Peter Shadie, IUCN colleague reports *"Years ago I remember Kathy using her World Bank travel allowance, which in those days provided for business class travel between Washington and London, to help fund a WCPA publication. She convinced the Bank's accounts department that she could fly economy and use the difference in a more impactful way for*

conservation". Perhaps another reason Kathy found resources to assist young people and projects was that she had little interest in the trappings of luxury, fine clothes, expensive accommodation or comfortable flights. We all remember her trusty modest backpack and her standard simple trousers and shirts which lasted many years. She was steadfastly economical so WCPA's funds could be used for better causes.

One special memory will remain for many of us. Kathy's last Steering Committee Meeting as Chair was held in 2019 in Amboseli National Park, Kenya. Our accommodation was stunning with a dramatic view of the 5,895 m snow-capped Mount Kilimanjaro with large groups of elephants ambling past our conference and monkeys peering in the windows. Although hard workers we soon decided early morning safaris were essential. Kathy allowed this indulgence and enjoyed it herself. It was a particularly positive meeting of people who were far more than colleagues, but close friends. We shall remember that wonderful week and our outstanding leader for the rest of our lives.

Many tributes have been made some capture our dear friend and colleague particularly well.

Madhu Rao Chair of the IUCN World Commission on Protected Areas

Kathy worked tirelessly, championing protected areas and OECMs as being critically important for biodiversity conservation. Nature has lost one of its greatest allies; we have a responsibility to honour her important legacy by continuing her work the best we can.

Trevor Sandwith, former head IUCN Global Protected Areas Programme and current Director of the Centre for Conservation Action.

"Kathy and I worked together constantly for 25 years on some of the most important topics in conservation. In particular, we were convinced of the need to mainstream biodiversity into social and economic transformation. But I value most the many extensive efforts we made to translate ideas into effective guidance for practitioners, ranging from transboundary conservation to equitable governance of sites. I can just picture Kathy now on the many train trips to the International Nature Conservation Academy on the island of Vilm, furiously editing texts and shaping them to be of greater use for those working in the field. While adamant that standards should be high, Kathy has a tough, but warm, regard for all of our efforts".

Mike Wong, WCPA Vice Chair for North America

"Around our planet, Kathy will always be recognized as a passionate and tireless champion for nature conservation. She constantly elevated the agenda of the WCPA, to drive the actions that the world so sorely needs. Likewise, Kathy will be remembered as an affable friend who motivated us and generously shared her insight, experience, and support. You will be missed."

Simon Stuart, Chair of the IUCN Species Survival Commission 2008 - 2016

"Kathy You were always a fighter for conservation, you said it as it was, and were a passionate and fearless advocate that we should do our very best for nature. The conservation world is weaker today without your drive, commitment, and of course sense of humour! Thanks so much, Kathy, for everything."

ECONOMIC VALUATION OF ECOSYSTEM SERVICES OF QURUMBER NATIONAL PARK IN GILGIT-BALTISTAN, PAKISTAN

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ABSTRACT

Communities in high-altitude regions are particularly dependent on ecosystem services for their survival. Understanding the economic value of ecosystem services is crucial for sustainable management of mountain ecosystems and associated policy development. This study estimated the economic value of selected ecosystem services provided by the Qurumber National Park (QNP) using data collected from 393 local households. This value was estimated as PKR 738.37 million (US$ 4.28 million[1]) per year, corresponding to PKR 615,308 (US$ 3569[1]) per household per year. Provisioning services contributed PKR 706.828 million (US$ 4.01 million[1]) per year which constituted 96 per cent of the ecosystem service value. This study argues that given the lack of economic opportunities and high poverty rate in the valley communities, pressure on the park's resources is increasing, resulting in depletion of important ecosystem services in the park, thereby posing a key challenge for conservation efforts. This study recommends a need to better recognise the ecosystem services provided by the park in policy decisions. An efficient institutional mechanism should be developed to provide alternative livelihood options for the local community to minimise pressure on the park's natural resources. The findings of this study serve as baseline information for both researchers and policymakers to maintain this vitally important mountain national park.

Key words: high altitude park, value assessment, local development, conservation, livelihoods

INTRODUCTION

Ecosystem services are benefits which humans can derive from the natural ecosystems for their physical, social and economic well-being (Millennium Ecosystem Assessment, 2005). This concept was originally developed to raise awareness for ecosystem and biodiversity conservation (Birkhofer et al., 2015). Ecosystem services are classified into four categories: provisioning services, regulating services, cultural services and supporting services. Provisioning services include material outputs from ecosystems such as water, food and other resources. Regulating services include benefits arising from the abiotic and ambient biotic environment such as disease control, flood control and climate regulation. Cultural services include non-material uses such as recreational activities and cultural benefits, while supporting services include the nutrient cycling that maintains the conditions for life on Earth (Millennium Ecosystem Assessment, 2005).

In high-altitude regions, ecosystem services and biodiversity are under-researched in terms of their ecological relationships and the benefits they offer to both mountain and downstream communities (Murali et al., 2017), and to eco-tourists. In recent times, development activities in these landscapes have caused significant environmental degradation and are threatening biodiversity. Sharma et al. (2015) argued that a lack of understanding and an inability to acknowledge the importance of the monetary value of these ecosystem services and their contribution to local economies are major factors that hamper more sustainable management of such areas. Valuation of such mountain ecosystem services could provide data to support better management (Huang & Upadhyaya, 2007; TEEB, 2009), and enhance decision making directed towards conservation of related ecosystems (Bateman et al., 2010; Kumar, 2005; Pearce, 2001). Such evaluations

Last village in the Qurumber valley © EJAZ WWF-Pakistan

can enable managers to assess potential trade-offs among ecosystem services (Shedayi et al., 2022; Schroder et al., 2016) and identify efficient allocation of the resources associated with protected areas (Pisani et al., 2021).

Mountain regions in Pakistan contain unique ecosystems and species, landscape features such as glaciers, and important natural resources such as water, pastures and forests. As such, they are a major source of ecosystem services upon which millions of people depend. The mountainous region of Gilgit-Baltistan in northern Pakistan presents a good example of such endowments and dependencies. However, with rapid socioeconomic development, and climate change, pressure on ecological resources is increasing. Developments in the region are generating significant economic benefits, but at the same time contributing to adverse impacts on mountain ecosystems and biodiversity. Ensuring adequate consideration of such environmental impacts is therefore of increasing importance. In this context, adopting an environmentally sensitive development perspective has the potential to provide sustainable livelihoods to the local community and in the long run conserve natural resources and landscapes.

National parks play a significant role in conservation, and if they are properly managed can also generate significant earnings to governments and local communities. The economic valuation of protected areas is currently receiving considerable attention from policymakers and park managers, as such information can assist with the identification and design of funding mechanisms and the provision of sustainable recreation opportunities to tourists (Pisani et al., 2021). However, there is a dearth of valuation studies in the context of mountain regions in Pakistan, even though these regions provide important ecosystem services to both mountain and downstream communities. In such circumstances, economic valuation of protected areas can be instrumental in persuading governments to initiate efficient management mechanisms for the sustainable flow of ecosystem services. Mountain ecosystems of Gilgit-Baltistan are hot spots for international and domestic tourists, contributing significantly to the economic value of the cultural ecosystem services of Pakistan (Shedayi et al., 2022). However, current development activities in the region, increasing population and climate change pose serious threats to the provision of important mountain ecosystem services, demanding immediate attention from policymakers (Shedayi et al., 2016).

This paper estimates the economic value of ecosystem services provided by the Qurumber National Park (QNP) in Gilgit-Baltistan and provides an insight into the current dependency of local communities on the services of the national park. Results of this study will help the park authority to devise a better management plan for the conservation of the protected area's values. They could also assist the Government of Pakistan to assess the economic feasibility of an ecosystem payment mechanism designed to increase funding for the park and contribute

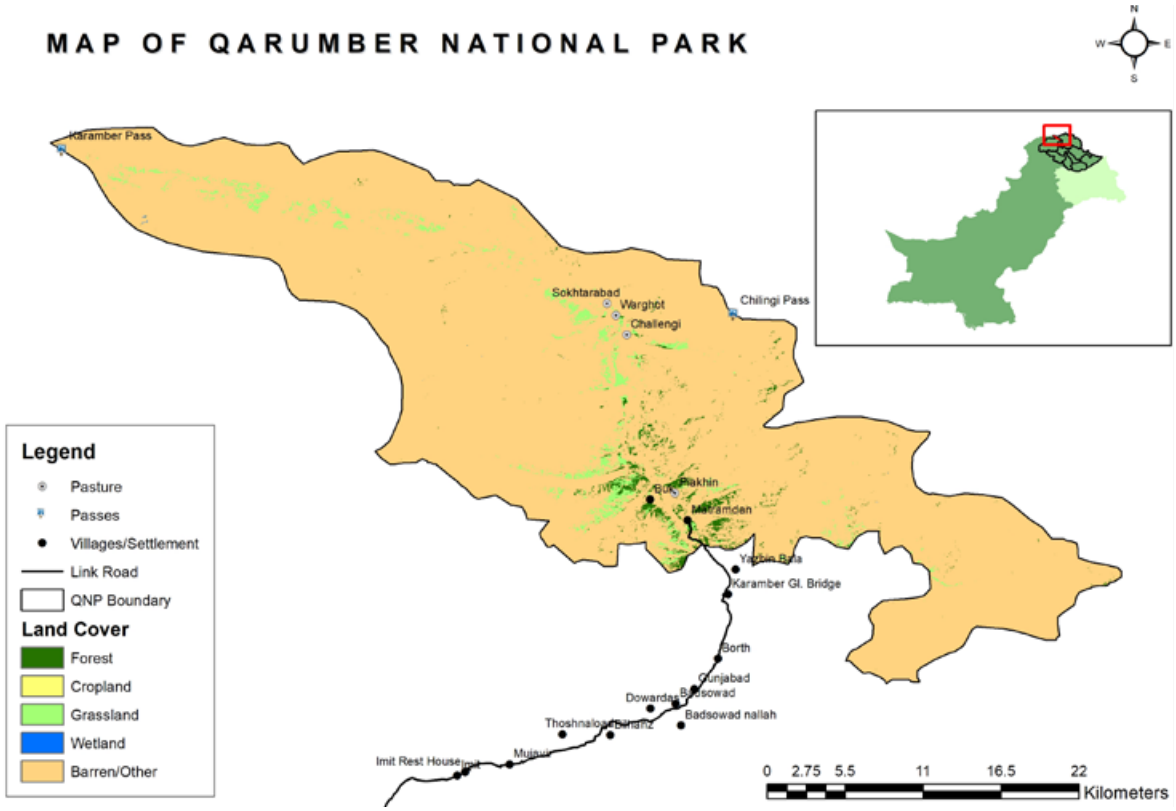

Figure 1. Map of the study area

towards improved environmental conservation efforts. The findings also serve as a starting point for considering the views of local people who directly contribute to the management of the park as well as assist with provision of enhanced recreational opportunities for domestic and international tourists. Furthermore, the findings of this study can serve as a baseline for further research into the value of ecosystem services derived from protected areas in remote mountain regions.

METHODS

Study area

Qurumber National Park in Ishkoman, Ghizer District of Gilgit-Baltistan, Pakistan was officially established in 2011 by the Department of Wildlife and Parks, an agency of the Government of Gilgit-Baltistan, Pakistan (Figure 1). The ecosystems of QNP are mainly high altitude deserts where annual rainfall rarely exceeds 150 mm. QNP, which covers an area of 73,800 hectares, is unusual in the sense that the local communities of Qurumber valley approached the Government of Gilgit-Baltistan urging its establishment. QNP serves to conserve the vitally important natural resources of the valley and also provides significant economic and ecological benefits to local communities. The Qurumber valley is sub-divided into many small villages and the buffer zone of QNP has approximately 1,200 households. Most of the communities living in the buffer speak the Wakhi language, with the Khowar language also commonly spoken by local people. The main source of households' livelihoods is agro-pastoralism. Goat and sheep rearing are the dominant practices while a considerable number of households also rear cattle and yak. Table 1 indicates the areas of various land class categories in the Qurumber valley and QNP. These areas were determined from Landsat 8 OLI data of 2016. It is evident from Table 1 that 51 per cent of the valley and 66 per cent of the park are covered by snow and glaciers which are the sole sources of fresh water supply for the buffer zone communities. Soil/rocks stood second in terms of land coverage, accounting for 28 per cent of the valley and 27 per cent of the park. Grass/shrubs covered 19 per cent of the valley and 7 per cent of the park, whereas agricultural land covered only 0.8 per cent of the valley and 0.06 per cent of the park.

Across the Gilgit-Baltistan region, less than 2 per cent of the land is under cultivation and in the Qurumber valley the figure is even lower, at only 0.77 per cent. As indicated in Table 1, much of the area is covered by snow and glaciers which are the main sources of water for drinking and irrigation. Water is one of the main ecosystem services in QNP, supporting both the domestic needs of downstream communities and sustaining the productivity of crops. Qurumber valley residents grow maize, wheat, potatoes, a variety of vegetables and

Land cover class	Qurumber valley		QNP	
	Hectares	Percent	Hectares	Percent
Snow/glacier	68,413	51.216	48,704	65.826
Soil/rocks	37,978	28.431	20,290	27.423
Grasses/shrubs	25,694	19.235	4,837	6.538
Agriculture land	1,034	0.774	45	0.061
Sparse conifer	282	0.211	21	0.029
Water	100	0.075	79	0.106
Broadleaved, conifer	73	0.054	7.	0.010
Peatlands	5	0.004	5	0.007
Total	**133,578**	**100.000**	**73,989**	**100.000**

Table 1: Land cover classes in Qurumber valley and QNP

fruits such as apple, peach and cherry. These goods are primarily produced for local consumption.

Data collection

Data for this study were collected using a survey of households conducted during October and November 2021 in all villages of the Qurumber valley. Survey design was assisted by a literature review (Din et al., 2020), two focus group discussions and six in-depth interviews with local residents and members of the village welfare organisation, as well as input from WWF-Pakistan. Thirty respondents provided feedback on a pilot version of the survey which prompted several useful amendments. The final survey is given in the supplementary online material. The survey covered 32 per cent of the total population in the study area (393 households out of 1,200). A survey team was hired from the local population (who therefore knew the local language and were aware of the cultural sensitivities of the region) for final data collection. The survey team was given one day of training before the start of the survey.

The household questionnaire, which included closed and open-ended questions, was divided into five sections. Questions in the first section related to households' socioeconomic and demographic profiles and the second section contained questions related to perceptions of the relative importance of ecosystem services provided by the park. Section three included questions related to the types of crops grown by households and the market value of each crop. Section four contained questions related to the types and quantities of fruits produced and their market prices. The final section contained questions related to the livestock owned by households and the market value of this livestock.

Valuation method

Following guidelines in MEA (2015), this study considered provisioning and regulating services. The provisioning services of the park were evaluated using the current market price method whereas a benefit transfer method was used in the valuation of regulating services of the park. Following Sharma et al. (2015) and Din et al. (2020), the estimation of total provisioning services of the park (TVP) was made using the following equation:

$$TVP_i = \sum_{i=1}^{n} (HH) * (NV_i)$$

where i represents the various provisioning ecosystem services, HH is the cumulative number of households living in the buffer zone, and is the annual average benefit obtained per household.

Valuation of provisioning services: crops

During our discussions with the local communities of the Qurumber valley, we found that the staple crops are wheat, maize, potatoes, vegetables and barley. Based on the studies of Sharma et al. (2015), Murali et al. (2017) and Din et al. (2020), the market price method was used in estimating the value of these crops:

Net annual crop income per household

= (crop yield per household × local price of the crop in kg)

- input cost of the gross income

Based on the focus group discussions with the local community, we considered the input cost as 60 per cent of the gross income from crops. The above equation gives a net annual value of crops per household and this value is

Local community campaigning for protection of QNP natural resources © EJAZ WWF-Pakistan

multiplied by the total number of households (1,200) in the study area to give the total economic value of the crop.

Valuation of provisioning services: fruits

Through the focus group discussions, we identified the main fruits grown by households in the valley as apples, apricots, pears, grapes and cherries. Using the market price method, the valuation of these fruits was made using the following equation:

Net annual fruits income per household
= (annual fruit production per household
× local price of the fruits in kg) - input cost

The input cost of producing these fruits was assumed to be 30 per cent of the gross value of the fruits.

Valuation of fuel wood

Qurumber National Park provides fuel wood for the community living in the buffer zone. In the household survey we asked households to report their annual consumption of fuel wood collected from the QNP. This turned out to be 40 kg per household. The valuation of this fuel was then estimated using the following equation:

Net annual value of fuel wood per household
= (annual fuel wood consumed per household
× local price of the fuel in kg)

Owing to the prevailing high unemployment rate (observed during the focus group discussions with the local community), the opportunity cost of time for labour in the collection of fuel was taken to be zero.

Valuation of domestic water consumption

Much of the QNP is covered by snow and glaciers which are the sole sources of freshwater for the inhabitants living in the buffer zone of the park. In this study, we used minimum per capita water consumption (WHO, 2013) and multiplied it by the local price of water (Murali et al., 2017) to estimate the total value of water per household.

Valuation of cultural ecosystem services: trophy hunting

Communities living in the buffer zone of QNP have successfully established conservation practices where open hunting is not allowed. The valley has a good population of Himalayan Ibex (*Capra sibirica hemalayanus*) and a trophy hunting programme has been successfully practised in the region. We collected data from the conservation organisation of the Qurumber valley regarding revenue generated from the trophy hunting programme. Annually, an average of four to five permits are granted to hunters, and annually around PKR 0.7-0.8 million are earned from the trophy hunting programmes. This study calculated the net earnings from trophy hunting by subtracting the management fee (20 per cent of the gross income). The net revenues go directly to civic development of the valley.

Valuation of regulating services: carbon sequestration

The carbon sequestration index (CSI) measures the potential of vegetation at a particular site to sequester carbon in comparison to the total emissions at that site. If the value of CSI is less than one, then the area is considered a carbon emitter, whereas if the value of CSI is greater than one, the site is considered a carbon sequester

(Wahyudi & Afdal, 2019). Din et al. (2020) estimated the value of carbon sequestration for QNP using the benefit transfer method. They calculated the annual value of carbon sequestration using the following equation:

Annual Value of Carbon Sequestration
= area under cultivation and grassland
× corresponding carbon sequestration index ×
per unit price of CSI

This study used the carbon sequestration result estimated by Din et al. (2020).

DATA ANALYSIS AND RESULTS

Villages sampled

This study surveyed ten villages in the Qurumber valley using the systematic random sampling technique. During our focus group discussion and personal interviews with the local community, it was established that Qurumber valley has a population of around 1,200 households. In order to obtain a representative sample, we sought responses from 400 households. However, seven questionnaires were not properly completed and we thus obtained 393 valid responses, representing 32 per cent of the total population of the Qurumber valley. The distribution of the sample is shown in Table 2.

Table 2: Sampled villages in Qurumber valley

Village	No. of responses	Percent
Badswat	40	10.2
Bilhanz	62	15.8
Borth	11	2.8
Lower Gishgish	42	10.7
Immit	147	37.4
Matramdan	12	3.0
Nowbahar	6	1.5
Shamshabad	18	4.6
Tashnalot	36	9.2
Upper Gishgish	19	4.8
Total	**393**	**100.0**

Perceived importance of ecosystem services

QNP provides significant ecosystem services for the local community living in the buffer zone. In the household survey, we asked respondents about the importance of various provisioning, regulating and cultural services provided by the park. Responses were rated for importance on a scale as indicated in Table 3.

Table 3 shows that 80 per cent of the respondents considered the pastures of QNP to be important in terms of providing fodder for livestock. The most important provisioning service was water (100%) followed by wildlife (93%) and energy resources (92%). Respondents rated flood prevention (93%) as the most valued regulating service, followed by climate regulation (92%), water regulation (92%) and carbon sequestration (90%). Tourism and recreational services were considered important by all respondents with knowledge generation (94%) also regarded as important by most people.

Economic valuation of provisioning services

Local communities living in the Qurumber valley get direct as well as indirect benefits from QNP. Table 4 shows the estimated economic value of provisioning ecosystem services of the QNP at both household and aggregated levels. The total economic value of the provisioning services of the Qurumber valley was estimated to be PKR 706.828 million per year which translates into PKR 0.589 million per household per year. Provisioning services contribute approximately 96 per cent of the total economic value with the most important of these being livestock, domestic water use, fuel wood and livestock production.

Agriculture products (crops and fruits)

The net annual value of crops was estimated to be PKR 0.0272 million per household per year after deducting input costs which were assumed to be 60 per cent of their gross value. Similarly, the annual net value of fruits was estimated to be PKR 0.0037 million (PKR 3,700) per household per year after subtracting input costs which were assumed to be 30 per cent of their gross annual value. The shares of crops and fruits in the total value of provisioning services were 4.6 per cent and 0.6 per cent respectively (Table 4).

Livestock

Livestock rearing is the major source of livelihood in this remote mountain region in Pakistan. While focus group discussions revealed that livestock rearing is declining, a significant number of households still follow this traditional practice. Yak, cows, goats and sheep are the most commonly kept livestock in the valley. In the household survey, respondents were asked about the number of livestock they kept. The average herd size was ten animals per household. This livestock is heavily dependent on fodder from grasslands in the buffer zone. The total economic value of livestock was estimated to be

Table 3. Community perceptions regarding importance of ecosystem services

Types of ecosystem services		Percentage of responses				
		Not important	Moderately important	Important (3)	Very important (4)	Sum (3+4)
Provisioning Services	Fodder	14.2	5.1	13.0	67.2	80.2
	Energy resources	0.0	8.4	20.5	71.2	91.7
	Medicinal plants	7.6	1.5	28.0	62.3	90.3
	Raw materials	7.4	3.3	28.5	60.8	89.3
	Genetic resources	4.6	9.2	31.0	55.9	86.9
	Water	0.0	0.0	24.7	75.3	100.0
	Wildlife	5.9	1.5	25.0	67.7	92.7
Regulating Services	Flood prevention	5.3	1.5	24.7	68.0	92.7
	Carbon Sequestration	6.1	3.6	35.6	54.7	90.3
	Climate regulation	5.9	1.8	37.0	55.2	92.2
	Water regulation	5.9	1.8	39.0	53.2	92.2
Cultural Services	Knowledge generation	5.1	1.8	40.0	53.7	93.7
	Educational value	6.9	8.0	23.7	61.1	84.8
	Culture	7.6	3.6	38.0	50.6	88.6
	Aesthetic value	8.1	13.0	29.3	50.1	79.4
	Tourism and recreation	0.0	0.0	37.0	63.0	100.0
	Mental health benefits	7.4	3.8	36.0	53.2	89.2

Table 4. Valuation of ecosystem services of QNP

Services of QNP	Total value (million PKR)	US$[1] (million)	Average value (million PKR/ household/year)	Percent
Provisioning services				
Crops	32.68	0.19	0.0272	4.6
Fruits	4.43	0.03	0.0037	0.6
Fuel wood	178.56	1.04	0.1488	25.3
Domestic water use	341.64	1.98	0.2847	48.3
Livestock	149.52	0.87	0.1246	21.2
Provisioning subtotal	*706.83*	4.10	*0.589*	*100*
Cultural service (trophy hunting)	0.6	0.00	0.005	
Regulating service (carbon sequestration)	30.94	0.18	0.0258	
Aggregated ecosystem service value	738.37	4.28		

Migratory birds at Qurumber river © EJAZ WWF-Pakistan

PKR 149.52 million per year which translates into PKR 0.125 million per household per year, with the share of livestock in total provisioning services at 21 per cent.

Fuel wood

Households in the buffer zone use wood as an energy source and QNP directly provides much of this fuel wood. We estimated the total annual value of fuel wood in the valley to be PKR 178.56 million per year which translated into 0.1488 million per household per year. The share of fuel wood in the total value of provisioning services was 25 per cent.

Domestic water consumption

Communities living in the buffer zone of QNP depend heavily on the water resources originating from the park. Three major glaciers are located within the park and glacier melt is the primary water source for domestic consumption. The estimated total economic value of domestic water consumption in the valley is PKR 341.64 million per year, equivalent to PKR 0.2847 million per household per year. Domestic water consumption was the most significant component of provisioning ecosystem service value at 48 per cent.

Cultural service

A trophy hunting programme is being successfully implemented in the Qurumber valley. In 2021 five permits were granted for the hunting of Himalayan Ibex, with an average price per animal of approximately PKR 150,000. The regional government charges 20 per cent of the income as a management fee, with the remaining 80 per cent going directly to the local community conservation organisation. This income is used for various civic purposes in the valley. This study estimated that the annual total income earned from trophy hunting is PKR 0.6 million which translates to PKR 500 per household per year.

Regulatory service

The total value of carbon sequestration for the QNP was obtained from the study of Din et al. (2020). The total value was estimated to be PKR 30.94 million per year which translates to PKR 25,785 per household per year in the valley.

Economic value of QNP ecosystem services

The economic value of ecosystem services associated with QNP was estimated to be PKR 738.37 million per year which translates to PKR 615,308 per household per year in the valley. The contribution of provisioning services was estimated to be PKR 706.828 million per year which is approximately 96 per cent of the economic value of the QNP ecosystem services and each household in the buffer zone receives PKR 589,023 per year. Cultural services contribute PKR 500 per household per year which is 0.08 per cent of the ecosystem service value. The contribution of regulating ecosystem services was estimated to be PKR 25,785 per household per year which accounted for approximately 4 per cent of the QNP ecosystem service value.

Limitation of the economic estimates

Due to the lack of current and historical data, the economic values of two important services of the park could not be estimated: tourism and timber. The values obtained in this study therefore should be counted as the minimum value of QNP ecosystem services. It is hoped that future research might remedy this shortcoming.

Local community perceptions of QNP

Local communities in the buffer zone are increasingly being accepted as partners in the effort towards sustainable management of natural resources. Such community-based conservation is based on the notion that conservation strategies should include local communities in decision-making, and conservation should be of interest to, and conducted by and for local communities, who are then active partners in protected area management (Zhang et al., 2020). It follows that conservation based on the local community achieves its goals by: (i) allowing local communities to live in and around the protected area to ensure their participation in land use management decisions; (ii) ensuring local community access and use rights over a protected area's natural resources; and (iii) ensuring economic benefits from conservation actions flow to the local communities (Nilsson et al., 2016). It has been widely accepted and reported that community-based conservation programmes have multiple benefits for local communities (Bajracharya et al., 2006). Decreased poaching and provision of direct economic benefits through activities such as trophy hunting and game shooting have been shown to accrue from such programmes (Di Minin et al., 2021).

Given the potential for additional income generation for local communities, further promotion of trophy hunting in the QNP needs to be considered. Currently, the price per trophy hunt is around PKR 150,000 to PKR 200,000 per license, and important local income is earned from this sport. While discussing the income from trophy hunting, one of the focus group participants noted:

> *"Conservation of wildlife is really a great concept and we have conserved our previous wildlife through a community-based conservation model. Annually, we earned around PKR 400,000-500,000 from the trophy hunting programme and these earnings go directly to the development programmes of the valley."*

During one of our focus group discussions, a 60-year-old male participant noted that:

> *"We, the people of Qurumber valley, had ourselves demanded the establishment of QNP and our case is unique because local people have themselves realised the importance of protected area and conservation efforts and thus, we had requested government for the establishment of QNP because it will have multiple benefits to our generation in terms of conservation of our precious assets and provision of economic opportunities to local communities."*

Since QNP was mainly established on the demand of the local community, the local community foresee many potential benefits to offset the costs of QNP. However, costs and benefits may vary over time and from person to person. The establishment of the park has imposed economic opportunity costs on the local population in terms of limiting potential future access to park resources and an inability to increase the area of cultivated land. This issue warrants closer scrutiny, and assessment of the magnitude of such costs is recommended.

Several focus group respondents also highlighted various challenges facing the valley. One participant urged action regarding the imprecise delineation of the QNP boundary:

> *"We request the forest and wildlife department of the Gilgit-Baltistan government to help us in defining the boundaries of the QNP. People from the other side (Khyber Pakhtunkhwa side) falsely claim the ownership of Qurumber Lake despite the fact that historically Qurumber Lake belongs to Ishkoman valley. Therefore, there is a need for provincial government level action to be taken."*

During focus groups, it was also observed that local communities have limited livelihood options and their dependency on park resources is very high. Given the lack of economic opportunities and high poverty in the buffer zone communities, pressure on park services is increasing, so there is a significant risk of degradation to important ecosystem services provided by the park. There is a critical need for managers to work with local communities to identify alternative livelihood options in the region. During interactions with the local communities, it was observed that the valley has a significant comparative advantage in the production of mountain-specific products such as apples, apricots and walnuts, but lack of market access and limited capacity to add value is hampering the growth of such industries. There is the potential to address such issues through local training programmes focused on achieving market potential through value chain development and value-adding initiatives. Appropriate tourism development within the park also offers significant potential for generating additional income for local people across the valley.

Communities of the Qurumber valley are highly vulnerable to climate change. Various natural hazards have already been exacerbated in various parts of the valley. For example, in 2018 a glacial lake outburst flood in the Badswat area of Qurumber valley disconnected the area from other parts of the valley. The debris transported by the flood blocked the river and it created an artificial lake. Agricultural land, livestock and many houses were swept away by the flood. Such events are now occurring annually in this part of the valley. Such hazards have a significant impact on the socioeconomic life of the local communities. Despite this, adaptation strategies and options are very limited and valley residents continue to be highly vulnerable to the impacts of climate change. An important emerging policy agenda relevant to Qurumber valley is to understand the adaptation capacities of local communities. In this connection, capacity building within local communities to manage climate change impacts is a critical need.

CONCLUSION

QNP is important for the conservation of important natural resources in the valley and also provides significant economic and ecological benefits to the local community. The study shows that local communities in the QNP buffer zone are highly dependent on park ecosystem services for their well-being and subsistence. A feature of QNP establishment is that it was a local community demand-driven initiative. The results show that the economic value of QNP ecosystem services are estimated to be PKR 738.37 million per year which translates to PKR 615,308 per household per year. The contribution of provisioning services is estimated to be PKR 706.828 million per year which is 96 per cent of the total economic value of QNP ecosystem services.

The success of any policy intervention in the QNP will largely depend on the extent to which policymakers are equipped with the full contextual data, knowledge and the capacity to make informed decisions. Other factors important for the success of policy implementation are the provision of enabling conditions for capacity building in local communities, strengthening governance and stakeholder engagement, equitable benefit-sharing, and promoting value synergies in ways that minimise trade-offs between conservation and development. This study shows that QNP has significant environmental, economic, cultural and social values that policymakers should consider and incorporate into their planning and management decisions. The potentially conflicting economic drivers associated with inappropriate development present a major threat to the flow of services from the park, so it is important to ensure that the park management plan generates tangible economic benefits for local communities. To this end, providing employment opportunities and diversifying economic opportunities are urgent priorities. Failure to address such needs will jeopardise the livelihoods of the local communities and place at risk the conservation and sustainable management of the QNP. Although not assessed in this research, the QNP has significant potential to attract increased numbers of domestic and foreign tourists. To capitalise on this opportunity while ensuring the sustainable growth of this sector, an economic assessment of current and projected tourism within the park, together with an enhanced dialogue between ecotourism experts and policymakers, is recommended as a basis for developing an enhanced ecotourism management plan.

ENDNOTES

[1] 1 PKR = US$0.0058 rate for 1 November 2021

SUPPLEMENTARY ONLINE MATERIAL

Community questionnaire

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RESUMEN

Las comunidades de las regiones de gran altitud dependen especialmente de los servicios ecosistémicos para su supervivencia. Comprender el valor económico de los servicios ecosistémicos es crucial para la gestión sostenible de los ecosistemas de montaña y para el desarrollo de las políticas correspondientes. de los ecosistemas de montaña y el desarrollo de políticas asociadas. En este estudio se ha calculado el valor económico de determinados de los ecosistemas del Parque Nacional de Qurumber (PNQ) a partir de datos recogidos en 393 hogares locales. Este valor se

estimado en 738,37 millones de PKR (4,28 millones de USD1) al año, lo que corresponde a 615.308 PKR (35691 USD) por hogar y año. hogar al año. Los servicios de aprovisionamiento aportaron 706,828 millones de PKR (4,01 millones de US$1) al año, lo que constituían el 96% del valor de los servicios ecosistémicos. Este estudio sostiene que, dada la falta de oportunidades económicas y el alto índice de pobreza de las comunidades del valle, la presión sobre los recursos del parque está aumentando, lo que se traduce en el agotamiento de importantes servicios ecosistémicos en el parque, y en la pérdida de biodiversidad. de importantes servicios ecosistémicos en el parque, planteando así un reto clave para los esfuerzos de conservación. Este estudio recomienda la necesidad de reconocer mejor los servicios ecosistémicos que presta el parque en las decisiones políticas. Debería desarrollarse un mecanismo institucional eficaz que ofrezca opciones de subsistencia alternativas a la comunidad local para minimizar la presión sobre los recursos del parque. minimizar la presión sobre los recursos naturales del parque. Los resultados de este estudio sirven como información de referencia tanto para tanto para los investigadores como para los responsables políticos, con el fin de mantener este parque nacional de montaña de vital importancia.

RESUME

Les communautés des régions de haute altitude sont particulièrement dépendantes des services rendus par les écosystèmes pour leur survie. La compréhension de la valeur économique des services écosystémiques est cruciale pour la gestion durable des écosystèmes de montagne et pour l'élaboration des politiques correspondantes. des écosystèmes de montagne et l'élaboration des politiques correspondantes. Cette étude a estimé la valeur économique de certains services sélectionnés fournis par le parc national de Qurumber (QNP) en utilisant des données collectées auprès de 393 ménages locaux. Cette valeur a été estimée à 738,37 millions PKR (4,28 millions USD1) par an, ce qui correspond à 615 308 PKR (35691 USD) par ménage et par an. par ménage et par an. Les services d'approvisionnement ont contribué à hauteur de 706,828 millions PKR (4,01 millions USD1) par an, ce qui représente 96 % de la valeur de l'écosystème. 96 % de la valeur des services écosystémiques. Cette étude soutient qu'étant donné le manque d'opportunités économiques et le taux de pauvreté élevé dans les communautés de la vallée, la pression sur les ressources du parc augmente, ce qui entraîne l'épuisement d'importants services écosystémiques dans le parc. d'importants services écosystémiques dans le parc, ce qui représente un défi majeur pour les efforts de conservation. Cette étude recommande de mieux reconnaître les services écosystémiques fournis par le parc dans les décisions politiques. Un mécanisme institutionnel Un mécanisme institutionnel efficace devrait être développé pour fournir des moyens de subsistance alternatifs à la communauté locale afin de minimiser la pression sur les ressources du parc. minimiser la pression sur les ressources naturelles du parc. Les résultats de cette étude servent d'informations de base pour les chercheurs et les décideurs politiques. les chercheurs et les décideurs politiques afin de préserver ce parc national de montagne d'une importance vitale.

ROLE OF FAO, CATIE AND IUCN IN THE EXPANSION OF LATIN AMERICA'S PROTECTED AREAS IN THE 1960S–1980s

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ABSTRACT

From the 1960s to 1980s there was an enormous increase in the number, area and management quality of protected areas throughout Latin America. In 1960, there were only 122 protected areas, covering 6.5 million hectares in the region, while nine countries, including Colombia, Paraguay and Peru, had none. By 1989, this had increased to 797, covering 116.9 million hectares. This growth was 3.8 times higher than the growth of protected areas worldwide in the same period. In 1990, the region represented 16.5 per cent of the total world protected area. The catalysts for this sudden increase in conserving representative samples of natural ecosystems in Latin America are explored. It is concluded that, to a large extent, it was due to the combined influence, on one side, of the United Nations' Food and Agriculture Organization (FAO) and the Tropical Agricultural Research and Higher Education Center (CATIE) of Turrialba (Costa Rica) by promoting the education and training of professionals and, on the other side, of the IUCN and WCPA, that provided awareness, a sense of urgency and facilitated horizontal cooperation to promote the establishment of protected areas as well as support for the professional teams of each country. Of the several personalities who contributed directly to this progress, Gerardo Budowski from Venezuela and Kenton R. Miller from the USA clearly stand out, working over three decades on behalf of the institutions above.

Key words: Nature conservation, international institutions, local actors.

INTRODUCTION

Until 1960, the theory and practice of conserving biological diversity through protected natural areas had extremely limited application throughout Latin America. There was only some progress in the largest countries, such as Argentina, Brazil, Mexico and Chile. The most common management category was that of national parks and their establishment usually did not meet the requirements of ecological representativeness.

However, several of the parks in those countries are among the oldest in the world. Mexico's El Chico National Park, established in 1898 as a forest reserve, is reputed to be the first in the region. Argentina established its first park in 1903, which became the famous Nahuel Huapi National Park in 1934. Chile had already created the Vicente Pérez Rosales National Park (1926) and Ecuador established the Galapagos Islands National Park in 1934.[1] Brazil and Venezuela also established their first national parks, Itatiaia and Henri Pittier, respectively, in 1937. These promising beginnings were followed by a slowdown in the growth of the number of protected areas and their area. In 1960, nine countries in the region still did not have any park or nature reserve.

This situation changed rapidly in the 1960s. Latin America initiated a vertiginous and sustained increase in the number, extension, ecological representativeness and management quality of protected areas. Thirty years later, this movement positioned the region at the same level as others, including in terms of policies, legislation and institutional setting. This article identifies and discusses the causes of these trends and cites its main actors at the international level and, as much as possible, in each country.

Evolution of protected natural areas in Latin America between 1960 and 1990

In 1929, the region had only five protected areas, increasing to 46 by 1949 (Dourojeanni, 1980). In 1960, there were only 124 protected areas in the region, covering 6.5 million hectares (IUCN, 1990) and the situation regarding protected areas in each country was highly variable. Argentina, Brazil, Mexico, Venezuela and Chile had several national parks and equivalent reserves. These protected areas covered almost two million hectares in Argentina, a million or more in Brazil and Chile, and more than half a million in Mexico and Venezuela. Ecuador had the Galapagos Island National Marine Park which extended over almost 800,000 hectares, but it had none on its mainland. Bolivia established its Sajama National Park in 1939 but management was not established at that time. Meanwhile, other South American countries of great size and economic importance, such as Colombia[2] and Peru, in addition to Paraguay, did not have any protected areas and this was also the case of other countries, mostly Central American. Costa Rica was a relative exception as it established the Irazu 'National Park' in 1955 as an IUCN Category IV but no management was in place (IUCN, 1990).

Gerardo Budowski (1925–2014)

Excepting Argentina, which already had appropriate legislation and an administrative capacity proportional to the task, the management of existing protected areas was in its infancy in this period. Their ecological representativeness was poor. In Argentina, as is well known, a geopolitical criterion prevailed as promoted by Perito Moreno, the historic founder of the Argentine national parks system, placing several of the largest of 25 new areas along international boundaries, especially along the Chilean border. Chile also established its first park along its border with Argentina. In Mexico most of the 25 areas created before 1960 were very small. On the other hand, many of those established in that period responded more to ethical and aesthetic considerations rather than ecological ones in terms of localisation, size, design and management categories. In other words, their value as reservoirs of representative and durable examples of the biological diversity of the countries or the region was limited.

In short, in 1960 the region lagged far behind the rest of the world, representing only 5.4 per cent of the world's protected area. A large part of its biomes and ecosystems were unprotected and, with the relative exception of the countries mentioned, the public had no knowledge of or interest in conservation. Most countries had no policies, legislation or public institutions responsible for overseeing species and ecosystems conservation, even though practically all countries in the region had signed and ratified the Convention for the Protection of the Flora and Fauna and the Scenic Beauties of America, approved in Washington on 12 October 1940.[3] Despite the efforts of conservationists like Gilbert Pearson, a prominent member of the Audubon Society, who in the early 1940s visited South American countries promoting the establishment of local institutions to stimulate the application of the Convention (Cushman, 2013), most countries did not apply it or pursue its goals until the 1960s (Urban, 1998; Dourojeanni, 2009, 2022).

However, by coincidence, in 1961 a great symbolic change was marked by the creation of the first national parks in Colombia and Peru (Cueva de los Guacharos and Cutervo, respectively) and by a series of new and important Brazilian parks, based on better scientific criteria, all established in 1961, including Brasilia, Emas, Chapada dos Veadeiros, Monte Pascoal, São Joaquim, Sete Cidades and Tijuca (Pádua & Coimbra Filho, 1977; IUCN, 1990).

In 1990, the region had 797 protected areas covering 116.9 million hectares (16.5 per cent of the world total). That is an extension 18 times greater than in 1960. In that year at the global level there were 651.5 million hectares protected, with this number having grown only a little more than five times, including the expansion of protected areas in Latin America itself and the inclusion of the gigantic Northeast Greenland National Park (1974) that distorted the statistics with its 70 million hectares (IUCN, 1990).

Colombia, Peru, Costa Rica, Paraguay and Panama, among others, went from practically not having any protected areas to having dozens of them covering millions of hectares. Countries that already had reasonable numbers of parks and reserves managed to increase the total area protected more than tenfold. In 1990, there was no longer any country in the region that did not have some reasonably managed protected areas, in addition to specialised public agencies responsible for their administration.

There is no doubt that this rapid progress would not have been possible without the presence in each Latin American country of a new generation of professionals, who were highly motivated, aware of the importance of the subject and well trained, unlike previous generations

that emphasised the ethical aspects of nature protection but did not put their proposals into practice (Dourojeanni, 2009, 2022). This generation was mostly formed in the late 1950s through the 1980s. Many of them assumed leading positions in forestry and other sectors responsible for natural heritage in the 1970s and 1980s. The academic training and motivation of this new generation of Latin American environmentalists was not spontaneous. As will be seen, several international organisations had a critical role in their education and training.

Education has been a key factor. However, it is also evident that especially in the 1970s and 1980s, the incipient but growing global interest in the environment influenced the vocations of young Latin Americans. The international concern for the environment became clearer at the United Nations Conference on the Human Environment (Stockholm, 5–16 June 1972). One of the consequences was the 1977 establishment in Venezuela of the region's first ministry of the environment. Also noteworthy were the initiatives of the Photographic Hunting Institute (INCAFO) and the Iberic-American Cooperation Center of Spain that, in the late 1970s and early 1980s, produced the luxurious and widespread collection 'Nature in Iberic-America' that contributed significantly to the awareness of the ruling classes in the region. Luis Blas Aritio, its director, facilitated each country to produce a splendid, illustrated book describing its parks and other protected areas (Padua and Coimbra-Filho, 1977; Dourojeanni and Ponce, 1979). INCAFO also published Kenton Miller's book 'Planificacion de Parques Nacionales para el Ecodesarrollo de América Latina' (1980) that became the reference for protected areas planning in the region. No less important, and also in 1980, the IUCN published its influential 'World Conservation Strategy' (IUCN, WWF & UNEP, 1980) which spelled the end of traditional protectionism and highlighted the vital importance of well-planned protected areas for development.

Furthermore, the political situation prevalent in the 1960s and 1970s in several countries helped to promote protected areas. These countries were ruled by regimes that, demonstrably in the case of Peru (Dourojeanni, 2020) and Brazil (Padua, 2015), were particularly receptive to the issue of natural heritage conservation. Finally, as will be seen, the activities of IUCN and of what is now called the World Commission on Protected Areas (WCPA) had a great influence in the region and offered support that effectively stimulated a productive friendly competition between those responsible for protected areas in each country in the region.

The professionalising role of FAO and CATIE

In the late 1950s and 1960s, most of the countries began the phase of preparing professionals for the establishment and management of protected areas. At this stage and continuing into the 1970s and 1980s, the universities where conservation professionals were being trained also played a fundamental role in the planning of the national systems of protected areas. These were adopted and applied by public institutions, mostly the forest services or their equivalent. The role of the faculties of science or forestry engineering was decisive, since they were the only ones that at that time created chairs in the administration of protected areas and wildlife management and, as early as the 1980s, established specialised postgraduate degrees. While Argentina has been a pioneer in the training of park rangers since 1928, most other countries began to train rangers only in the 1960s.

Gerardo Budowski and Lee Talbot, former IUCN executive directors, in Peru in 1967.

The Food and Agricultural Organization of the United Nations (FAO) played a crucial role in this phase, promoting and supporting the creation of faculties and schools of forest engineering in several Latin American countries. In 1968, there were 17 university forestry faculties or schools in nine countries of the region (Shirley & Prats, 1969), almost all of which included the academic topics required to establish and manage natural protected areas. Of these, ten were created between 1958 and 1963. Several were assisted by projects implemented with FAO cooperation and financing from the United Nations Development Programme (UNDP). FAO experts in wildlife management and protected areas administration were included among the staff of these projects (Dourojeanni, 2009, 2022).

On the other hand, the Tropical Agricultural Research and Higher Education Center (CATIE), created by the Inter-American Institute for Cooperation on Agriculture (IICA) of the Organization of American States, moved to

Paracas National Reserve, Peru, established in 1975 © Marc Dourojeanni

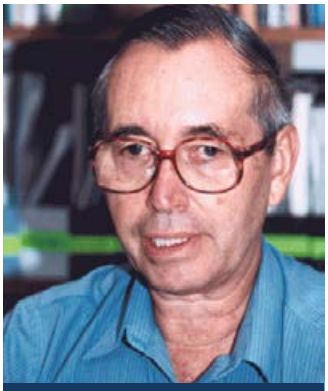
Turrialba in 1960. From its inception, it had the conservation of biological diversity as one of the goals of its forestry programme. For a long time, this area was overseen by the Venezuelan forester and professor, Gerardo Budowski (IUCN, 2014). From the early sixties, Budowski both personally and through his staff at CATIE trained several dozens of Latin Americans in conservation forestry, including protected areas management. Among them was the Costa Rican team led by Mario Boza, who after his graduation from CATIE became the founding director of the Costa Rican National Park Service and oversaw the creation and management of its first functioning national parks. It has been estimated that up to 1993, CATIE trained around a thousand professionals from all over Latin America, especially from Central America, including an estimated 40 individuals that had obtained their master's degree through its own programme (Barzetti, 1993). To carry out this mission, Budowski made alliances with other organisations and obtained sufficient international financing. The forester Kenton Miller (Miller, 2011; UNESCO, 2011), who worked for several years with Budowski in Turrialba, actively participated in this task. Arne Dalfelt, Craig McFarland, Roger Morales and James Barborak, among others, entered the programme.

From the 1970s to 1990s, FAO was also active in protected areas through several field forestry projects in the region that involved wildlife and protected areas experts including Gary Wetterberg (Brazil), Paul Pierret and Rudolf Hofmann (Peru) and Kyran Thelen (Chile). Similarly, Kenton Miller, while collaborating with FAO in Chile and with the help of the UNDP-Rockefeller Brothers, established the Latin American Program on Wildland Management in 1970, which was expanded with the support of the US National Parks Service and the University of Michigan, where Miller also taught. Compact practical trainings were offered that included visits to protected areas in the US and Canada, as well as mobile seminars, international courses, workshops and practical in-service training. This programme contributed to the training and encouragement of a hundred or more mid and high-level active staff of the public agencies responsible for protected areas, and young university professors in this field.

Several of the FAO experts assigned to the region made important contributions to the planning, establishment and management of protected areas as well as training local staff. Gary Wetterberg participated in the expansion of protected areas in the Brazilian Amazon (Wetterberg, 2017; Pádua, 2015, 2020). Paul Pierret helped design the

first Peruvian system of protected areas, including the Manu National Park, and launched the Vicuna Management Program that was continued by Rudolf Hofmann (Dourojeanni, 2009, 2022). FAO hired several other valuable experts, including Kyran Thelen, Allen Putney, William Deshler and John Moreley, who also worked in the Chilean based Regional Wildland project. Likewise, other experts worked either as FAO consultants or as US National Parks Service advisors, such as Curtis Freese, William Wendt, Craig McFarland, Alan Moore, Bernardo Zentilli and James Barborak. All these experts had great personal knowledge of the region and excellent command of Spanish. While not directly working for protected areas, many distinguished scientists, often associated to the IUCN Survival Service Commission, also played a significant role in designing the national systems. Mention must be made of John Terborgh, Jean Dorst, Ian Grimwood, George Schaller, Ghillean Prance, Archie Carr, Russell Mittermeier and Nicole Duplaix.

The IUCN and the WCPA



Mario Boza, Costa Rica. Deceased in 2021.

The International Union for Conservation of Nature (IUCN) was created in 1948 with the support of UNESCO, at a time when, despite the fact that government institutions for environment and nature conservation already existed in developed countries, there was none at the international level. The only entity that preceded IUCN was the Council for the Preservation of Birds (now BirdLife International). The IUCN, despite not being a typical governmental international organisation, filled the global gap for decades, steadily and increasingly assuming the role of a world environmental governing body. This task was facilitated by the creation of the World Wildlife Fund (today the World Wide Fund for Nature), that initially had financing IUCN as its predominant role (Holdgate, 1999).

The IUCN was originally based on two lines of work, which for decades were its two main commissions: the conservation of species (Species Survival Commission, SSC) and natural protected areas (World Commission on Protected Areas, WCPA). IUCN grew and acquired enormous global relevance given the existing vacuum which lasted until the creation of the United Nations Environment Programme (UNEP) in 1972, with which IUCN collaborated directly on protected areas, species conservation and environmental law.

As Holdgate (1999) recalls, until the beginning of the 1970s when Budowski became IUCN's Director General, it had little activity in Latin America. Its interest was focused on Europe and North America, from where all its authorities and officials came. Due to the rapid decolonisation process, Europeans also turned their attention to Africa and, to a lesser extent, to Asia. This was justified because, on one hand, environmentalists from Europe wanted to consolidate the protected areas they had established before independence and, on the other hand, they were racing to save samples of ecosystems not yet protected. Meanwhile, Latin America received much less attention although some of its members, as well as a few from WWF, showed some concern for the region. Among these were the Swiss Lukas Hoffmann who was World Vice President in both institutions and the Belgian Jean Paul Harroy, a founder of the IUCN who, despite his involvement in Africa, showed special appreciation for South America. Both were instrumental in providing support for several conservation actions. However, as in the case of the Galapagos National Park, these were exceptions and, especially at the staff level, until the 1970s IUCN did not demonstrate much interest in Latin America.

Budowski changed that situation and opened IUCN's doors to a new wave of Latin Americans, in the Council, the Commissions and even among the staff. Several of his former CATIE students, already in government or academic positions, were invited to join IUCN governing bodies, and the voice of the region was better heard. During the 1970s and 1980s, several of those who had established Latin-American protected areas joined the IUCN Council, such as Mario Boza and Roger Morales (Costa Rica), Paulo Nogueira Neto, Maria Tereza Jorge Padua and Jose Pedro Costa (Brazil), Marc Dourojeanni (Peru) and Cecilia Blohm (Venezuela). Particularly in the Commissions, the number of representatives of the region increased significantly. At the staff level, some Latin-American professionals were appointed, the Chilean Bernardo Zentilli among others. But this reached a peak when, in 1975, Kenton Miller, with enthusiastic support of Latin Americans, was elected president of the WCPA. Later, in 1982, he was

The author and Kenton Miller in Brazil, in 1982.

appointed Director General of the IUCN, a position he held until 1988.

A considerable number of events, meetings and reciprocal assistance missions between countries in the region were carried out in the 1970s and 1980s, including the World Parks Congresses in Yellowstone (USA, 1972), Bali (Indonesia, 1982) and Caracas (Venezuela, 1992), which had growing Latin American participation. Miller assisted Jeff McNeely to organise the Bali (1974) and Caracas (1984) congresses. In addition, WCPA regional meetings were held in Peru in 1977 and 1991 (UICN, 1991) and in Argentina (UICN, 1986). Bali and Caracas World Park Congresses had significant influence on the regional movement in favour of protected areas. These were opportunities to present achievements and to receive international support and, in particular, they provided valuable directions for the future. Also important has been the opportunities these events provided to coordinate technical and financial assistance. Several other minor subregional events took place in different countries, such as Central American regional meetings on protected areas led by Miller and Budowski in 1974 in Costa Rica and another led by CATIE which Miller attended in 1987 in Guatemala, as well as the global IUCN Congress, with a strong focus on protected areas, in Costa Rica in 1988.

Kenton Miller (1939-2011)

The combination of the early efforts of Miller and Budowski for the training and motivation of Latin American professionals in the 1960s and 1970s, mostly before assuming their respective roles in IUCN, contributed to IUCN and WCPA working with professionals from the region, and played an undoubtedly important role regarding the sharp increase in new protected areas in the region. The professionals who participated in the training and events organised by Miller's Regional Wildland Management Project and later by IUCN added up to two hundred. Especially beginning in the 1970s and continuing well into the 1980s, these efforts created a significant horizontal cooperation among protected areas' staff in each country and stimulated healthy competition. During that period, key individuals who became environmental leaders in each country were identified and stimulated. Several of them exchanged high-level positions between universities, public administration and non-governmental organisations that proliferated all over the region in the 1980s. IUCN's assistance was technical, but especially appreciated was its help to channel resources from international organisations such as the WWF, especially through Russel Mittermeier and Thomas Lovejoy, young professionals deeply involved in Latin America, and The Nature Conservancy (TNC), as well as from bilateral sources, such as the USA, Germany, New Zealand, Belgium, Canada and Switzerland, or from multilateral sources, mainly UNDP and FAO, that were decisive for the establishment and management of protected areas in several countries. A special mention should be made of the US Peace Corps in the late 1960s and early 1970s as several of its recruits became the international experts mentioned previously, for example, Gary Wetterberg. He served as Peace Corp volunteer in the parks of Chile and Colombia before becoming FAO officer in Brazil. At that time, despite being young and unexperienced, several of them were instrumental in establishing and managing protected areas (Wetterberg, 2017; Dourojeanni, 2022).

The Latin American results and actors

Jorge Hernandez, Colombia (1935–2001)

The results were as rapid in countries that did not have protected areas as in those that were already relatively advanced. Among the first, the case of Costa Rica stands out. Two young Budowski disciples, Mario Boza and Álvaro Ugalde, were the architects of the creation of 28 protected areas by 1989 and, in addition, they gained strong support from national society and policymakers. They have been pioneering examples for the entire region, demonstrating that conservation leaders, just like park rangers, can get their hands dirty in the field (Rueda, 2021; Vaughan, 2022). Another outstanding case has been that of Colombia, which went from having no protected areas to, three decades later, having 42 protected areas covering 9.3 million hectares. Many people participated in this task, but it is known that much of the scientific planning for the endeavour was conducted by Jorge Hernandez-Camacho[4], a prominent natural scientist who inspired many in Colombia and in other countries. Among others that contributed during this period, are Simon Max Franky, Fernando Ruan, Manuel Rodriguez and Heliodoro Sanchez.

Peru underwent a similar evolution in the same period, managing to establish 24 protected areas covering 5.5 million hectares, including the Manu National Park with 1.7 million hectares. This task began at La Molina

University, where in the 1960s the system of protected areas was designed and then applied in the 1970s and 1980s, especially by Marc Dourojeanni, who also led the forestry sector. He benefitted from the help of Carlos Ponce and later Antonio Brack in government and Augusto Tovar and Manuel Ríos in the university (Dourojeanni, 2009, 2022). Paraguay, which was without protected areas until 1960, managed to establish 12 covering 1.2 million hectares, including the large Defensores del Chaco National Park. Rosa Villamayor played a significant role in this process in Paraguay. Other countries without protected areas in 1960 and that added several by the end of 1989 were Panama, Honduras, the Dominican Republic, Nicaragua and El Salvador. Other countries, such as Guatemala, Uruguay and Cuba, that had just a few parks previously, also established several more. The names of Edgardo Sevilla and Hugo Francisco Morales (Guatemala), Dario Tovar (Panama) and Edgardo Sevilla (Honduras) must be mentioned. From Uruguay the work of Gabriel Caldevilla and Alvaro Larrobla is noted. Suriname and Guyana, that already had a few protected areas in 1960, also increased their number and area, but not as significantly as other regional countries. The activities of Ivor Jackson and Bal Ramdial in support of Caribbean protected areas were also considerable.

Progress was similarly rapid in countries that by 1960 already had systems of parks and reserves. Argentina, the nation that was the most advanced in the region in nature conservation, went from having 25 protected areas in 1960 to 113 in 1989, with 12.6 million hectares, a sixfold increase in coverage. In this case there were many important actors from the public administration, such as Italo Constantino, Jorge Morello and Jorge Barroso, but also others from civil society such as Maria Buchinger and Francisco Erize[5] and from academia such as Ricardo Luti. Antonio Torrejón, a great promoter of tourism in nature (Marín & Pérez, 2020), also played an important role during this period, and later, Obdulio Menghi and Pedro Tarak participated as well. In 1960, Bolivia had only two relatively small, not managed parks, but by 1989 it had 23 covering 6.8 million hectares. It is difficult to attribute merits for this achievement, but José Imaña and Armando Cardozo stood out among others. Brazil, which already had 18 protected areas before 1960, increased its protected area system to 162 areas covering 20.5 million hectares by 1989. Although many actors contributed to this achievement, two closely linked to the IUCN played a fundamental role in this period: Maria Tereza Jorge Pádua and Paulo Nogueira Neto.[6] The former was largely responsible for the creation of 15 parks and reserves including over 8 million hectares, mainly in the Amazon (Padua, 2015). The latter is well

Maria Tereza Jorge Pádua (Brazil)

Bernardo Zentilli, Chile. Deceased in 2021

known for the establishment of a network of ecological stations (Nogueira Neto, 2010). Jose Candido de Melo Carvalho, Alceo Magnanini and Admiral Ibsen de Gusmão Câmara[7] (Urban, 1998; Mittermeier et al., 2005) were also important actors during this period. Several others also played significant roles such as Angela Tresinari, José Pedro Costa and Sonia Wiederman. Chile is another notable case. Indeed, between 1960 and 1989, it progressed from 21 protected areas to 65, enlarging the protected area system thirteenfold, reaching 12.6 million hectares. Several names are associated with this success, including Fernando Hartwig, Bernardo Zentilli[8], César Ormazabal, Alejandro Gutierrez, Edmundo Fahrenkrog, Juan V. Oltremari and Hernán Torres, who came from government, academia and civil society. Before 1960, Ecuador had only Galapagos National Park, but by 1989 it had created 14 areas covering 10.7 million hectares, an impressive achievement for a country of modest size. Among those with important roles were Misael Acosta Solís and, especially, Juan Black (Arcos, 1997), who is well known for his exceptional work in Galapagos. Pablo Rosero and Angel Lovato must also be mentioned. Mexico that had already made good progress in conserving nature, continued to improve its system of protected areas, going from 25 generally small areas to 61 covering 9.4 million hectares in this period. Among those with significant roles is Gonzalo Halffter[9], to whom the promotion of biosphere reserves is attributed. Finally, the case of Venezuela is mentioned, which in 1960 had 0.6 million protected hectares, but jumped to 74 parks and reserves covering 20.3 million hectares in 1989. Gerardo Budowski was Venezuelan and, without a doubt, had an influence on that progress, but it was accomplished essentially due to the enthusiasm and dedication of its officials, academics and civil society. During this period, Arnoldo Gabaldon, Rafael García[10], José Ramón Orta, Cecilia Blohm, Edgardo Mondolfi, Pedro José Salinas and, more recently, Rafael Delgado stood out.

Chapada dos Veadeiros National Park, Brazil established in 1961 © Marc Dourojeanni

Focusing on the countries that in 1960 already had protected areas, their advances were impressive. Venezuela increased its protected area 34 times, Cuba 27 times, Bolivia 22 times, Brazil and Chile 17 times, and Mexico and Ecuador 14 times.

The personalities highlighted here are obviously not all those in each country who contributed to that success. But they are the ones that, as far as is known, were central actors in their countries. During those three decades, they attended many of the conferences and meetings, participated in directories, commissions and committees as well as in joint missions and field visits, among other events that established the fundamentals of a core group of leaders who demonstrated unified, strong, proactive and productive international camaraderie.

This is not intended to imply that the fast growth of protected areas over these three decades was a result of the support of the FAO and CATIE or of IUCN and its WCPA. In fact, during that time there were also other international sources of technical and financial assistance for biodiversity conservation, several have already been mentioned. But it is undeniable that without the external contributions of these individuals the process would have been much slower. At the same time, there is no doubt that this success in improving the ecological representativeness of protected areas in Latin America and particularly their protection and management on the ground was fundamentally the result of efforts of citizens of the countries profiled, including a still growing cadre of professional staff and rangers, national processes and political will.

CONCLUSIONS

This review demonstrates that technical assistance that meets high quality standards and is sustained over time may enable the achievement of important conservation goals. The assistance provided by FAO, IICA and IUCN was long-term, well designed and applied by professionals who, in addition to their technical capacity, had a deep knowledge of the Latin American realities and cultures, its deficiencies and peculiarities and who, therefore, knew how to do what was necessary to motivate local staff to break through the inertia. On the other hand, these three institutions provided a constant and sustained stimulus during the thirty years of the development of protected areas in the region.

The fact that, in those three decades, Latin America made an unparalleled effort at the world level in terms of the conservation of natural ecosystems and biodiversity is

little known and less recognised. What was achieved between 1960 and 1990 was just the beginning of a long process. Since then, the region has continued with more, new and better qualified professionals, to improve its system of protected areas in terms of quantity and efficiency of management as well as of ecological representativeness, despite the obstacles of underdevelopment, and especially the prevailing informality that, in these countries, makes it so difficult to apply and enforce environmental legislation.

Finally, this text is offered as a posthumous tribute to all the individuals mentioned and who, unfortunately, have left us. They were great fighters for a better future for all, based on the building of harmony between people and the natural environment. In closing, the gratitude that the region will eternally owe to Gerardo Budowski and Kenton Miller is reiterated.

ENDNOTES

[1] However, other sources indicate this park was actually established in 1959, with IUCN assistance. (https://www.galapagos.org/about_galapagos/history/)

[2] Some references mention La Macarena National Park as established in 1948. However, this park is listed as created in 1989 in the UN List of National Parks and Protected Areas.

[3] https://ecohis.jmarcano.com/areas-protegidas/antecedentes/washington/convencion/

[4] https://es.wikipedia.org/wiki/Jorge_Hern%C3%A1ndez_Camacho

[5] https://es.wikipedia.org/wiki/Francisco_Erize

[6] https://www.wwf.org.br/wwf_brasil/historia_wwf_brasil/paulo_nogueira_neto/; https://pt.wikipedia.org/wiki/Paulo_Nogueira_Neto

[7] https://www.oeco.org.br/wp-content/uploads/wp-post-to-pdf-enhanced-cache/1/27829-almirante-ibsen-uma-vida-dedicada-ao-meio-ambiente.pdf

[8] https://laderasur.com/articulo/la-huella-de-bernardo-zentilli-fallece-el-visionario-ingeniero-forestal-que-fue-parte-de-la-fundacion-del-parque-nacional-conguillio/

[9] https://www.unesco.org/en/articles/gonzalo-halffter-salas-driving-force-behind-biosphere-reserves-mexico-passed-away

[10] https://www.ecopoliticavenezuela.org/2020/04/28/jose-rafael-garcia-una-vida-dedicada-a-los-parques-naturales-en-venezuela/

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RESUMEN

Del comienzo del año 1960 al final de los años 1980 se produjo en América Latina un salto enorme en el número, área y calidad del manejo de las áreas naturales protegidas. En 1960 en esa región sólo existían 122 áreas protegidas cubriendo 6,5 millones de hectáreas, pero en 1989 ya había 797 áreas protegidas, cubriendo 116,9 millones de hectáreas. Este crecimiento fue 3,8 veces mayor que el crecimiento del área natural protegida a nivel mundial en el mismo lapso. En 1960 nueve países no tenían ninguna área protegida, entre ellos Colombia, Paraguay y Perú, pero en 1990 ya reunían docenas de ellas abarcando millones de hectáreas. Se exploran las causales que desencadenaron este aumento súbito del interés y de la acción para conservar muestras representativas de los ecosistemas naturales en América Latina. Se concluye que, en gran medida, se debe, por un lado, a la influencia combinada de la Organización de las Naciones Unidas para la Alimentación y la Agricultura (FAO) y del Centro Agronómico Tropical de Investigación y Enseñanza (CATIE) que contribuyeron eficazmente a la formación de profesionales especializados y debidamente capacitados y, por otro lado, a la Unión Internacional para la Conservación de la Naturaleza (UICN) y a su Comisión Mundial de Áreas Protegidas (CMAP), que crearon conciencia sobre la necesidad y urgencia de establecer esas áreas, incentivaron la cooperación horizontal y apoyaron a los equipos profesionales de cada país para hacer realidad las propuestas. De las varias personalidades que aportaron directamente a ese cambio, a partir de las instituciones citadas y durante todo el periodo, destacan nítidamente el venezolano Gerardo Budowski y el estadounidense Kenton R. Miller.

RÉSUMÉ

Entre les années 1960 et 1980, le nombre, la superficie et la qualité de gestion les aires protégées ont considérablement augmenté dans toute l'Amérique latine. En 1960, la région ne comptait que 122 les aires protégées, couvrant 6,5 millions d'hectares, et neuf pays, dont la Colombie, le Paraguay et le Pérou, n'en possédaient aucune. En 1989, ce nombre était passé à 797, couvrant 116,9 millions d'hectares. Cette croissance était 3,8 fois supérieure à la croissance des zones protégées dans le monde au cours de la même période. En 1990, la région représentait 16,5 % de l'ensemble les aires protégées dans le monde. Les catalyseurs de cette augmentation soudaine de la conservation d'échantillons représentatifs d'écosystèmes naturels en Amérique latine sont étudiés. Il est conclu que, dans une large mesure, elle est due à l'influence combinée, d'une part, de l'Organisation des Nations Unies pour l'alimentation et l'agriculture (FAO) et du Centre de recherche agricole tropicale et d'enseignement supérieur (CATIE) de Turrialba (Costa Rica), qui ont encouragé l'éducation et la formation des professionnels, et, d'autre part, de l'UICN et de la CMAP, qui ont fait prendre conscience de l'urgence de la situation et facilité la coopération horizontale pour promouvoir la création les aires protégées ainsi que le soutien aux équipes de professionnels de chaque pays. Parmi les personnalités qui ont contribué directement à ce progrès, Gerardo Budowski du Venezuela et Kenton R. Miller des États-Unis se distinguent clairement, en travaillant pendant plus de trois décennies au nom des institutions susmentionnées."

BIODIVERSITY CONSERVATION OF A NEW PROTECTED AREA 'AL-ARQOUB', SOUTH JERUSALEM HILLS, PALESTINE

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ABSTRACT

Palestine is part of the Fertile Crescent and known to be rich in faunal and floral biodiversity relative to its latitude. The South Jerusalem hills with their ancient villages (collectively called the Al-Arqoub cluster) provide ideal areas for conservation within the Mediterranean Biodiversity Hotspot. The area was listed on an emergency basis as a UNESCO World Heritage Site in 2014. This study assessed the biodiversity and threats, and the data was used to designate it a protected area by the Environment Quality Authority (EQA). We documented 417 plant species, 15 fungi, 105 birds, 3 amphibians, 12 reptiles and 31 mammals. Threats to this rich biodiversity included harmful agricultural practices, overexploitation, construction of Israeli settlements, urbanisation, habitat loss, land fragmentation and limited enforcement of laws. Management plans were established and began to be implemented for the site with the aim of biocultural conservation. Four marginalised communities around the valley system (Al-Walaja, Battir, Husan and Beit Jala) benefited through: a) environmentally friendly agricultural production for 81 farmers, b) developing and empowering women in eco-friendly production and marketing, c) enhancing ecotourism, d) implementing an ecosystem restoration model and e) education and capacity building leading to behaviour change. Based on IUCN criteria, we consider 'Al-Arqoub' as a vulnerable ecosystem worthy of enhanced protective status and, based on our studies, the EQA designated it as a protected area category VI (protected with sustainable use of natural resources). Protected area management in Palestine follows the new National Biodiversity Strategy and Action Plan (2023–2030) in line with the Kunming–Montreal Global Biodiversity Framework. This grassroots, cross-disciplinary endeavour to protect this area serves as a model for other protections in a region with economic and political instability.

Keywords: conflict zones; developing countries; restoration; environmental justice; World Heritage

INTRODUCTION

Since the Industrial Revolution, human population growth, rampant consumerism and the overexploitation of non-renewable resources have greatly damaged global environments and strained sustainability for both human and natural communities. The UN Sustainable Development Goals and the Aichi targets of the Convention on Biological Diversity (CBD) have attempted to address some of these challenges that are compounded in countries of the global south (Adenle et al., 2015; Allen et al., 2018). The new Kunming–Montreal Global Biodiversity Framework includes four goals and 23 targets. Target 3 calling for the protection of 30 per cent of land and marine areas by 2030 is ambitious and can only be meaningful and successful if it protects biodiversity while meeting human needs including through ecosystem services (Dudley et al., 2022).

Historic Palestine (now Israel and the Occupied Palestinian Territories) has high biodiversity because of its geography (the intersection of continents) and geology (the Great Rift Valley, the lowest point on Earth, and mountains such as Mt. Hermon/Jabal Al-Shaikh); yet the environment and biodiversity are under severe threat. The threat was first identified as a carrying capacity issue (Ives, 1950). Many global threats (e.g., climate change, habitat destruction, overexploitation, pollution, invasive species) and local threats (e.g. walls,

industrial settlements, bypass roads) have strained the local environment including the areas nominally designated protected areas (EQA, 2021; ARIJ, 2016; Husein & Qumsiyeh, 2022; Qumsiyeh & Abusarhan, 2021; Qumsiyeh & Amr, 2016; Qumsiyeh et al., 2014, 2016). This raises the question of how protection can be achieved considering the unstable political situation and impoverishment of Palestinians living under Israeli occupation, and whether it is possible to support biodiversity conservation while reducing poverty (Sunderlin et al., 2005; Roe et al., 2012).

The South Jerusalem hills and valleys in the Occupied Palestinian Territories were evaluated by the Palestinian Ministry of Tourism and Antiquities (MOTA) and submitted for emergency consideration as a UNESCO World Heritage Site (MOTA, 2015). This was due to threats to the rich ancient natural and cultural heritage, which includes early human habitation, Canaanitic agricultural terraces and watchtowers and historical heritage (Canaanitic, Roman, Byzantine and Islamic sites). The area endures numerous difficulties, including habitat loss, land fragmentation and challenging economic and political circumstances (Amr et al., 2016; ARIJ, 2016; Husein & Qumsiyeh, 2022; Qumsiyeh et al., 2014). Fifty nominally protected areas in the Occupied West Bank were recently (2022) evaluated by a professional team made up of the IUCN, the Palestine Institute for Biodiversity and Sustainability, the Environment Quality Authority (EQA) and stakeholders. The results, to be adopted/implemented in spatial plans early in 2023, eliminated some areas (many previously designated for political purposes), added others and consolidated others. One of the newly added areas was based on the data collected in this study, and we discuss below designating this as a new IUCN category VI protected area. This paper summarises the findings from the 2018–2021 study and conservation project that focused on the multiple threats to this area and innovative community endeavours to protect and sustain the flora, fauna and human residents of the valley and surrounding area.

MATERIALS AND METHODS

Study area. The core part of the proposed World Heritage Site comprises 2.6 km² of land of high conservation value interspersed with agricultural land with an equivalent buffer zone of an area of more than 5 km². These two valleys called Al-Makhrour and Wadi Husan along with a third valley (Wadi Ahmed/Cremisan valley) form a unique ecosystem of Mediterranean forested and maquis habitat with water springs (Fig. 1). It falls into the Mediterranean biogeographical zone

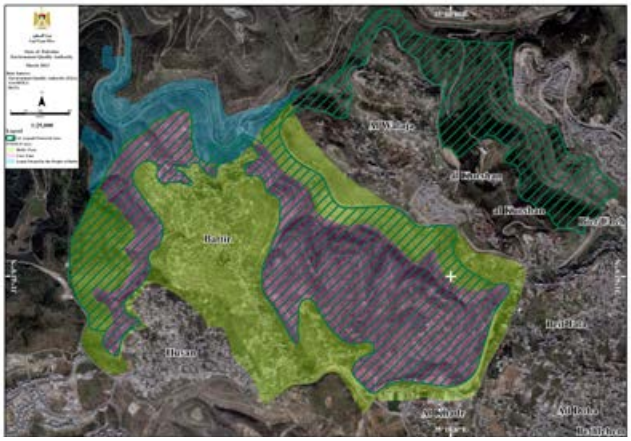

Figure 1. UNESCO World Heritage Site core and buffer area map (courtesy of MOTA, 2018). Our study included not just this area but the area to the north called Wadi Cremisan/Wadi Ahmed. Together, the areas in this study were designated a national protected area based on the data presented herein. The tentative borders of the new protected area are shown but may be adjusted somewhat with local participation and input in scheduled hearings soon.

and is an essential part of the hydrological system that replenishes the West Bank's western aquifer. It is an Important Bird Area and Important Plant Area (Radford et al., 2011), and was designated a Key Biodiversity Area by the EQA. Much of the studied area is located in Area C of the occupied West Bank, which means it is under Israeli civil and military control.

Five local communities surround the valley system: Battir, Al-Walaja, Husan, Al-Khader and Beit Jala. Four of the five were intensely worked with on agriculture and conservation during this project. With some other nearby villages, the local communities are collectively known as the Al-Arqoub area.

Project objectives. The main project focused on carrying out an inventory and assessment for biodiversity at both habitat and species level including threats leading to a management plan and actions while also providing benefits to people. Utilising the best scientific data to propose monitoring indicators and various conservation management and protection measures within the area of the World Heritage Site (both core region and buffer zone). In 2021, we expanded the scope of the study to include another nearby valley of Cremisan /Wadi Ahmed. We also worked with the local communities: a) working with 81 farmers in the four communities to enhance agricultural production through eco-friendly agriculture, b) working with four women's cooperatives to enhance product development and marketing while minimising human impact on the environment, c) working with key local stakeholders to enhance ecotourism, and d) working with youth in schools to

create environmental clubs and educational programmes to develop empowerment. In this report, we will focus on the biodiversity assessment, threats and lessons learned from this project which eventually led to the area being designated a protected area by the EQA. We will briefly mention but will not detail the economic and other empowerment benefits to the local communities.

Research methods. The steps engaged in this study to assess biodiversity and threats included:

1. Desktop study and 70 individual interviews covering private and public sectors using questions from Sutherland et al. (2009) to implement a SWOT (strengths, weaknesses, opportunities and threats) analysis to evaluate the degree of sustainability of the Palestinian sustainable environment.
2. Threat analysis was also guided by individual interviews with stakeholders and the EQA, and using the IUCN Threat Classification Scheme.[1]
3. In the target area, the Palestine Institute for Biodiversity and Sustainability of Bethlehem University conducted biodiversity (habitats, fauna, flora) studies and assessed key areas of concern using standard field methodologies such as RSCN (2005) and the Braun-Blanquet methodology (Wikum & Shanholtzer, 1978). We focused on rare plants as they serve as indicators (Al-Sheikh & Qumsiyeh, 2021).
4. We used the WWF's RAPPAM methodology (Rapid Assessment and Prioritisation of Protected Area Management). The RAPPAM methodology (Ervin, 2002) enabled identifying and analysing the scope, severity, prevalence and distribution of a variety of threats and pressures as well as identifying areas of high ecological and social importance and vulnerability. This assessment was performed through a participatory approach where an interactive workshop was held with policy makers, local authorities, local farmers and representatives, analysing the services provided on site, and identifying subsequent next steps and priorities.
5. The biodiversity management plan for the valley with conservation frameworks and restoration schemes for selected habitats used the Conservation Measures Partnership (CMP) (2013) model, IUCN guidelines and GIS/RS analysis.
6. After local consultation, the team decided to restore a 3-dunum area (1 dunum is 1000 square meters) with native trees and engaged in clean-up efforts for plastic and other waste produced in the whole valley. Awareness programmes and active outreach and communication strategies involving schools, farmers and women's cooperatives in the four communities were integral to this project.
7. We established long-term monitoring plans based on points 1 and 2 and on key expert evaluations. Monitoring was done on year 1 and selected faunal and floral indicators were assayed in year 3. Focus groups helped estimate threat levels to habitats and livelihoods on a scale of 1 to 5 (see Table 1 for description of threat levels with 5 being the highest).
8. Experts in areas such as permaculture and marketing supported the Al-Walaja, Battir, Beit Jala and Husan communities through sustainable agriculture, community empowerment, women's cooperatives and ecotourism. They also engaged in threat analysis.

RESULTS AND DISCUSSION

Inventory and assessment of biodiversity at species and habitat level

We leveraged research and close community relations to assess biodiversity levels for the purpose of management and conservation efforts. After an initial desktop study and focus group meetings of experts and stakeholders, extensive fieldwork was conducted over a period of one year and more selective fieldwork was conducted in the third year for comparison. We began publishing some of the data on the rich biodiversity of the valley (Handal & Qumsiyeh, 2019; Pahl & Qumsiyeh, 2021; Thaler et al., 2020). We documented more than 417 vascular plants, 15 fungi (Thaler et al., 2020), 105 birds, 3 amphibians, 12 reptiles, 31 mammals and hundreds of invertebrate species, and noted many rare plant species, such as *Carduus australis, Colichium hierosolymitanum, Herniaria glabra, Nonea philistaea, Onopordum carduiforme, Reseda alopecuros, Salvia indica, Verbena supina, Viola occulta, Gypsophila Pilosa, Polygonum argyrocoleon, Portulaca oleracea, Populus euphratica, Rumex dentatus, Cephalaria syriaca, Lactuca undulata, Onosma gigantea* and *Turgenia latifolia*. The work was later extended to two nearby valleys (Wadi Fukin to the southwest and Wadi Ahmed/Cremisan to the northeast) which added additional rare plant and animal species. For example, camera traps recorded wild cats, hyenas, porcupines, jackals, foxes and gazelles. Comparison of animals and plants seen in 2018 and 2020 showed no change but that is likely due to the interval being only two years.[2] The initial data acted as a baseline for the second and third years of monitoring and is important for future studies of temporal changes.

Threats to the biodiversity of the area

Table 1 lists the main threats to biodiversity documented over the three-year period of study of the project.

Other threats are noted in the area. Climate change represents the major threat for the Occupied Palestinian Territories (UNDP, 2010). Climate-related hazards, such as rainfall patterns, heatwaves, dry spells, frost, floods, sand- and windstorms are projected to become more frequent and severe. According to the National Adaptation Plan[3], in a mid-range scenario, should emissions continue increasing along recent trends, increasing temperatures and decreasing rainfall amounts are likely. Agriculture, agro-biodiversity and plant biodiversity in the country are highly vulnerable to climate change (EQA, 2021). Climate shocks undermine vulnerable farmers' capacity to cope and adapt to maintain their livelihood. Climate change in this area has started to affect sensitive species, such as land snails

Figure 2. Drone image of a destructive local practice in a rich biodiversity area in which bulldozers imported stone and soil to construct poorly engineered terraces and roads that blocked the natural flow of water in the valley.

Figure 3. A new Israeli settlement outpost recently started in the buffer zone of the World Heritage Site and within the protected area boundary.

Table 1 Summary of pressures posing threats to biodiversity in the study area. Threat levels are listed on a scale of 1–5 with 1 being minimal or no threat, 2 low threat, 3 medium, 4 high and 5 very high.

Pressure	Threats/notes	Threat level	Impact	Permanence
Habitat fragmentation	Encroachment (Figures 2 and 3)	4	Severe	Permanent (>100 years)
Agricultural practices	The use of fertilisers, pesticides and other chemicals (e.g., impact on pollinators)	3	Moderate	Medium (5–20 years)
Israeli occupation activities	The Separation Wall and land degradation (Husein & Qumsiyeh, 2022)	4	Severe	Permanent (>100 years)
Overexploitation of resources	Cutting trees and overgrazing. Steeper slopes more protected (Thaler et al., 2020). Gathering of wild plants in decline (e.g., in Artas, see Mourad Hanna et al., 2021)	3	Moderate	Medium (5–20 years)
Solid waste	Pollution impacts on wildlife (clean-up efforts underway)	4	High	Medium (5–20 years)
Invasive alien species	The Tree of Heaven (Ailanthus altissima) and two invasive insects have also been recorded in this area (Handal, 2017; Handal & Qumsiyeh, 2019), and the Myna Bird Acridotheres tristis is widely present (Handal & Qumsiyeh, 2021)	3	Moderate	Medium (5–20 years)
Increased local and international tourists	New less damaging hiking paths and trained tour guides can minimise threats	2–3	Moderate	Medium (5–20 years)
Feral/stray dogs and cats	Disruption in species numbers	3	High	Short (<5 years)
Climate change	Desertification resulting in changed habitats and loss of Mediterranean species	4	High	Medium (5–20 years)

(Amr et al., 2018) and amphibians (Salman et al., 2014). Many of the threats discussed above along with others (noise pollution, air pollution) could also be addressed through educational campaigns, legislation and campaigns on the ground involving local people. This is recommended both in the new National Biodiversity Strategy and Action Plan and in the new Protected Area Network published by the EQA in 2023. The Palestinian Institute for Biodiversity and Sustainability and many non-governmental organisations as well as the EQA are working on these aspects.

Intervention and conservation efforts

An understanding of the threats has enabled the authors to create a science and community-based conservation management plan for a new protected area and begin to implement it to promote eco-agriculture (81 small farm beneficiaries) and ecotourism, to work with the four communities located in the World Heritage Site to create eco-friendly village business plans and promote women's cooperatives in eco-friendly production and marketing. A plan to restore 3000 m^2 of key habitats was implemented by cultivating natural native trees in degraded or abandoned lands in areas of high conservation value.[4]

Consultants and experts helped produce a biodiversity management system[5] that was adopted by the major stakeholders (EQA, Ministry of Tourism and Antiquities (MOTA), Ministry of Agriculture (MOA) and local councils and was incorporated into the overall management plan for the World Heritage Site. End of project evaluations were conducted demonstrating uneven progress with improvements in selected localities and setbacks elsewhere.[6]

The notable habitat heterogeneity in the valley was considered when assessing threats. For example, plant cover and animal biodiversity on the southwest-facing slopes of the valley differed significantly from those on the northeast-facing slopes or in the bottom of the valley. This necessitated diverse approaches to managing threats in different areas (see below). Based on intensive habitat, faunal and floral surveys, five areas were selected as priorities for conservation with the total area evaluated (Fig. 3).

Conservation Area 1: This area supports three types of habitats in mixed or pure stands, namely maquis oak forest, olive groves and Garrigue association. The soil consists mainly of light rendzina, plant cover ranges from 40–90 per cent, and the elevation ranges between 709–805 m. This area is an essential habitat for vertebrates such as Golden Jackals, Red Foxes, Badgers, Porcupines and Mountain Gazelles, a globally threatened/endangered species, which we found in groups of three to eight. The region is a host for numerous plants, including rare species, such as *Salvia Indica, Verbena supina* and *Viola occulta*.

Conservation Area 2: This area supports four types of habitats in mixed or pure stands, mainly Maquis oak forest, olive groves, pine woodlands and Garrigue Plant cover ranges between 52–80 per cent, and soil is light to dark rendzina. The elevation ranges between 640–701 m. This is a crucial area for birds, amphibians, mammals and invertebrates. We also reported on presence of *Hyaena hyaena* (see Handal et al., 2019). The area supports three vulnerable birds, namely *Emberiza caesia, Anthus similis* and *Apus affinis*, and the growth of rare plants, such as *Cephalaria syriaca, Lactuca undulata, Onosma gigantea* and *Turgenia latifolia*.

Conservation Area 3: This area supports four types of habitats in mixed or pure stands, namely Maquis oak forest, olive groves, Garrigue association and agricultural terraces. Plant cover ranges from 60 per cent to 82 per cent, and the soil is a mixture between Rendzina and Terra Rosa. The elevation is between 584–601 m. Plant species found in this area include *Pistacia lentiscus*. The area encompasses a unique water aqueduct that takes the water from Battir Spring through the agricultural terraces. Several vital plant species, including *Arum hygrophilum*, *Populus euphratica, Arum dioscoridis* and *Rhamnus alaternus*, were observed. *Onopordum carduiforme* and *Scrophularia hierochuntina* are essential to conservation because they are threatened and endemic to Palestine and the Fertile Crescent region.

Conservation Area 4: This area supports three types of habitats in mixed or pure stands, mainly Maquis oak forest, olive groves and Garrigue association. Plant cover ranges from 57 per cent to 80 per cent, and the soil is a mix of Rendzina and Terra Rosa. The elevation is the lowest among the conservation areas and ranges between 550 and 586 m. Its habitats of mixed olive groves and oak maquis forest and agricultural lands contain less biodiversity than the other conservation areas but nonetheless support the growth of rare plants and form an environment for the growth of diverse herbaceous species.

Conservation Area 5: This area supports three habitats: oak Maquis, olive groves and Garrigue association. It is famous for the natural spring that forms a medium-sized pool from which birds and animals drink. It is a typical habitat for many plants species, such as orchids, and animals, such as geckos, bats, birds, and bees.

After the first survey study, we selected some species to survey again during the third year of the project from both plants[7] and birds[8]. The data indicated

Figure 4. Key biodiversity conservation areas identified from fieldwork on fauna and flora. Conservation Area 1 is the first shaded area located on the right of the map, and Conservation Area 5 is the least shaded area located on the left of the map.

improvements in habitat availability for some species (e.g., gazelles) and declines in others (e.g. some of the birds). The baseline and follow-up data were used in conjunction with the threat analysis to better manage the area. According to the IUCN Ecosystem Criteria (IUCN, 2016), this area may be classified as either a vulnerable ecosystem (VU) or even endangered ecosystem (EN). Specifically, we note declining distributions (e.g., of orchids), restricted distribution, degradation of the abiotic environment and altered biotic interaction (see Amr et al., 2016).

Designating a new protected area

Based on the totality of data above (flora, fauna, habitats, threats) and further analysis at IUCN regional headquarters in Amman, and in comparison with other local areas evaluated by our team (Palestine Institute for Biodiversity and Sustainability, EQA, stakeholders), the area was officially proposed and then recognised by the EQA as a new protected area to be called Al-Arqoub Protected Area. The information submitted was essentially the data described above including threats, designated conservation areas, proposed management plan, and feasibility of management. The area was further designated by the EQA as IUCN category VI because it contains natural areas where biodiversity conservation is linked with sustainable use of natural resources, which is incompatible with other IUCN categories. There were other side benefits to the work with EQA besides those mentioned above. With the cooperation of the EQA, we mapped an ecotourism pathway and installed signs to highlight what hikers might notice in terms of geology, flora and fauna and threats. We also developed a brochure in both English and Arabic for international and local visitors. Data reveal an increase in eco-friendly practices resulting in a 40 per cent average increase in agricultural production from the targeted farmers. Four women's cooperatives in the four communities were trained in eco-friendly production practices and the development of marketing plans for their products and connected to marketing outlets. Prior to COVID-19, a large festival was held to market products from approximately 25 local family vendors, and agreements were made with four large supermarkets to install shelves to market products. With the support of the project team, the four communities developed business plans to brand their communities and encourage eco-, cultural and agricultural tourism. Such tourism can help biodiversity conservation if structured well.

The information outlined above provided significant baseline data that helped designate the area as a protected area based on IUCN criteria in 2022 (to be incorporated in spatial plans in early 2023). But it also provided a model for working to bridge the science–policy–practice gaps noted earlier in protected area management (Qumsiyeh & Amr, 2016) by working with the communities in areas like sustainable agriculture, environmental education/awareness and demonstration of restoration potential. The results summarised above demonstrate that advancements can be achieved despite difficult circumstances. Ecotourism is increasing on the hiking path but this needs more regulation and education. Our work with women's cooperatives and schools in the area to increase awareness reduces human negative impacts on the environment. It was clear from working with 81 farmers in the area that it is possible to achieve biodiversity conservation while enhancing farmer production using permaculture and other eco-friendly practices. Ideally, our continuing work should allow for maintenance of a balanced mix of farmers' use and ecosystem conservation (Fig. 5).

Figure 5. An example of a balanced mix of natural conservation and agricultural areas

The World Heritage Site is in the Occupied Palestinian Territories, where, contrary to the Fourth Geneva Convention, Israeli settlements are being built. According to the Oslo Accords, most of the area is designated area 'C', where the Israelis have military and civil control. The team working on this project has challenged these activities by writing to UNESCO. Palestinian farmers and inhabitants of the valley have complained about the demolishing of farmhouses, burning of structures and confiscation of lands. Limitations on movement and work are evident. Efforts were exerted by the project team, farmers and communities to address and transcend these challenges. The wall causes the fragmentation of farms, forests and grasslands, affects water flows, and prevents access to and the use of lands and natural resources (Husein & Qumsiyeh, 2022). Furthermore, the restrictions on movement imposed on the Palestinian population by the walls and checkpoints impede necessary access to protect rich biodiversity areas (Qumsiyeh & Amr, 2016; Qumsiyeh & Abusarhan, 2021, 2022; Qumsiyeh & Albardeiya, 2022).

Many more successes than those noted above could occur if we address the imbalance of power (EQA, 2021; Qumsiyeh & Albaradeyia, 2022) and incorporate environmental justice issues in ecosystem services. Israel is expanding its segregation wall in the area around the site. Human rights organisations and the International Court of Justice have asserted that this wall is illegal (Kattan, 2007). The area was afforded some protection by being designated a UNESCO World Heritage Site, being one of fifteen Key Biodiversity Areas (KBAs), one of five Important Bird Areas, and one of the Important Plant Areas in the State of Palestine (Radford et al., 2011), and as a result of our work a protected area category VI. Although these multiple levels of protection led to improvement, much more could be done when peace is implemented and local people reclaim their sovereignty.

Our applied research in restoring land and educational components strengthened the capacity of local communities and related organisations to revive traditional farming techniques and safeguard their cultural and natural landscapes. Science–policy connectivity was enhanced through regular work with the EQA and all stakeholders that continues on a monthly basis especially as we prepared the NBSAP 2023–2030 in line with the Kunming–Montreal Global Biodiversity Framework. The Palestine Institute for Biodiversity and Sustainability that led this project was also selected to lead the production of the sixth national report for the CBD and to create a new national biodiversity strategy and action plan for the State of Palestine. As part of the latter work, more than 450 stakeholders convened weekly to build capacity and strengthen collaboration. For local people, motivation has increased through the use of human rights language (our rights to the land, work in permaculture as a form of resistance) and cultural heritage issues. Farmers' motivation increases as their nostalgia for their parents' and grandparents' practices and connectivity to the land are revived as was shown in a nearby area in Palestine (Mourad Hanna et al., 2021) and as is recognised globally (Berkes et al., 2000). The integrated conservation of biocultural diversity while taking care of people's needs was recognised in the recent COP15.

The Plan of Action of the Ministry of Tourism and Antiquities (2015) promotes and facilitates the private activation and utilisation of historical, natural and cultural sites. Tourism, mostly religious tourism with limited local tourism of all types (Tabash, 2017; PCBS, 2019), contributes significantly to Palestine's GDP. Yet, alternative forms of tourism, including ecological tourism are evolving and increasing in Palestinian areas. More than 29 hiking paths were established, including one in the study's target area (Qumsiyeh and Amr, 2019). Taking into account the baseline biodiversity studies, the authors collaborated with the Ministry of Tourism and the Environment Quality Authority to improve the path in Al-Makhrour. When COVID-19 prevented international tourism, local tourism, including hiking, increased in the study area (Qumsiyeh & Abusarhan, 2022).

CONCLUSION

Rich fauna and flora characterise a newly designated protected area (a candidate UNESCO World Heritage Site) in the occupied State of Palestine. It is possible to enhance ecosystem services and preserve habitats despite serious pressures and threats that can cause habitat loss and a decline in biodiversity. We demonstrate some success in working with the communities in a project to promote environmentally sound and sustainable development while restoring and conserving a rich natural system. Further work is needed to expand this pilot project to restore more habitats and enhance community appreciation of the intertwined cultural and natural heritage of Palestine. There remain, of course, the challenges of occupation and restriction of movement and a system of making local Palestinians dependent on Israeli occupiers. However, this study demonstrates biodiversity conservation even in a conflict zone aided by two aspects: scientific knowledge and promoting the well-being of local people.

ENDNOTES

[1] https://www.iucnredlist.org/resources/threat-classification-scheme

[2] https://www.palestinenature.org/conservation/Monitoring-indicators-Makhrour.pdf

[3] https://unfccc.int/files/national_reports/non-annex_i_parties/application/pdf/national_adaptation_plan__state_of_palestine.pdf

[4] Restoration scheme can be found here https://almakhrour.palestinenature.org/wp-content/uploads/2020/05/Annex-10-Habitat-Restoration.pdf

[5] Management scheme found here https://almakhrour.palestinenature.org/wp-content/uploads/2020/05/Annex-8-Biodiversity-Conservation-Plan.pdf

[6] https://www.palestinenature.org/conservation/Plant-Biodiversity-End-line-Report.pdf

[7] https://www.palestinenature.org/conservation/Plant-Biodiversity-End-line-Report.pdf

[8] https://www.palestinenature.org/conservation/Bird-Survey-at-Al-Makhrour-Valley-and-its-vicinity.pdf

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RESUMEN

Palestina forma parte del Creciente Fértil y es conocida por su rica biodiversidad faunística y floral en relación con su latitud. Las colinas del sur de Jerusalén, con sus antiguas aldeas (denominadas colectivamente agrupación de Al-Arqoub), ofrecen zonas ideales para la conservación dentro del punto caliente de biodiversidad del Mediterráneo. La zona fue inscrita con carácter de emergencia como Patrimonio Mundial de la UNESCO en 2014. Este estudio evaluó la biodiversidad y las amenazas, y los datos se utilizaron para designarla zona protegida por la Autoridad de Calidad Ambiental (EQA). Se documentaron 417 especies de plantas, 15 de hongos, 105 de aves, 3 de anfibios, 12 de reptiles y 31 de mamíferos. Entre las amenazas a esta rica biodiversidad se encontraban las prácticas agrícolas perjudiciales, la sobreexplotación, la construcción de asentamientos israelíes, la urbanización, la pérdida de hábitats, la fragmentación del terreno y la escasa aplicación de las leyes. Se establecieron y empezaron a aplicar planes de gestión para el lugar con el objetivo de la conservación biocultural. Cuatro comunidades marginadas de los alrededores del sistema de valles (Al-Walaja, Battir, Husan y Beit Jala) se beneficiaron de: a) una producción agrícola respetuosa con el medio ambiente para 81 agricultores, b) el desarrollo y la capacitación de las mujeres en producción y comercialización respetuosas con el medio ambiente, c) la potenciación del ecoturismo, d) la aplicación de un modelo de restauración de ecosistemas y e) la educación y la capacitación conducentes a un cambio de comportamiento. Basándonos en los criterios de la UICN, consideramos que "Al-Arqoub" es un ecosistema vulnerable merecedor de un estatus de protección mejorado y, basándose en nuestros estudios, la EQA lo designó como área protegida de categoría VI (protegida con uso sostenible de los recursos naturales). La gestión de áreas protegidas en Palestina sigue la nueva Estrategia Nacional de Biodiversidad y Plan de Acción (2023-2030) en consonancia con el Marco Global de Biodiversidad de Kunming-Montreal. Este esfuerzo popular e interdisciplinar para proteger esta zona sirve de modelo para otras protecciones en una región con inestabilidad económica y política.

RÉSUMÉ

La Palestine fait partie du Croissant fertile et est connue pour être riche en biodiversité animale et florale par rapport à sa latitude. Les collines du sud de Jérusalem et leurs anciens villages (collectivement appelés le groupe d'Al-Arqoub) constituent des zones idéales pour la conservation au sein du point chaud de la biodiversité méditerranéenne. La région a été inscrite d'urgence au patrimoine mondial de l'UNESCO en 2014. Cette étude a permis d'évaluer la biodiversité et les menaces, et les données ont été utilisées pour désigner la zone protégée par l'Autorité de la qualité de l'environnement (AQE). Nous avons recensé 417 espèces de plantes, 15 espèces de champignons, 105 oiseaux, 3 amphibiens, 12 reptiles et 31 mammifères. Les menaces qui pèsent sur cette riche biodiversité sont notamment les pratiques agricoles néfastes, la surexploitation, la construction de colonies israéliennes, l'urbanisation, la perte d'habitat, la fragmentation des terres et l'application limitée des lois. Des plans de gestion ont été établis et ont commencé à être mis en œuvre pour le site dans un but de conservation bioculturelle. Quatre communautés marginalisées autour du système de la vallée (Al-Walaja, Battir, Husan et Beit Jala) ont bénéficié : a) d'une production agricole respectueuse de l'environnement pour 81 agriculteurs, b) du développement et de l'autonomisation des femmes dans la production et la commercialisation respectueuses de l'environnement, c) du renforcement de l'écotourisme, d) de la mise en œuvre d'un modèle de restauration de l'écosystème et e) de l'éducation et du renforcement des capacités conduisant à un changement de comportement. Sur la base des critères de l'UICN, nous considérons "Al-Arqoub" comme un écosystème vulnérable méritant un statut de protection renforcé et, sur la base de nos études, l'AQE l'a désigné comme une zone protégée de catégorie VI (protégée avec une utilisation durable des ressources naturelles). La gestion des zones protégées en Palestine suit la nouvelle stratégie et le plan d'action nationaux pour la biodiversité (2023-2030), conformément au Cadre mondial pour la biodiversité Kunming-Montréal. Cet effort local et interdisciplinaire pour protéger cette zone sert de modèle pour d'autres protections dans une région en proie à l'instabilité économique et politique.

STATUS AND TRENDS FOR ARCTIC CONSERVATION MEASURES

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ABSTRACT

This paper provides an update on the 2017 status of Arctic protected areas. It provides an overview of the status and trends of the extent of protected areas in the Arctic and an overview of area-based conservation measures including World Heritage Sites and wetlands. This paper uses the International Union for Conservation of Nature (IUCN) definition for protected areas which includes a wide range of Management Categories – from strict nature reserve to protection with sustainable use. Consequently, the level of protection and governance of these areas varies throughout the circumpolar region. As of 2021, 20.77 per cent of the Arctic's terrestrial area and 5.24 per cent of its marine areas are protected. Protected area coverage of the Arctic's terrestrial ecosystems exceeded Aichi Biodiversity Target 11 which aimed for at least 17 per cent of terrestrial and inland water to be protected by 2020. The protected area coverage of marine areas fell short of the Aichi Target for 10 per cent of coastal and marine areas to be protected.

Key words: Arctic protected areas, Other Effective area-based Conservation Measures, OECM, Wetlands, Ramsar, EBSAs

INTRODUCTION

The Arctic[1] is experiencing cumulative and accelerating change with its ecosystems and species coming under increasing pressure from within and outside the Arctic by contaminants, over-exploitation of species, anthropogenic disturbance, resource extraction, landscape alteration, habitat loss and fragmentation (Aronsson et al., 2021; Christensen et al., 2021; Lento et al., 2019; Meltofte, 2013). These threats are intensified by climate change which presents by far the most serious threat to Arctic biodiversity (CAFF, 2013); and demonstrates that the challenges of biodiversity loss and climate change are interconnected, requiring comprehensive solutions and international cooperation (Smith & Young, 2022; CAFF, 2013). The establishment of new protected area networks and expansion of existing networks are recognised as key tools in addressing these crises (Smith et al., 2020; IPCC, 2019) and striving to maintain and conserve Arctic biodiversity and the functioning land and seascapes upon which species depend. Other Area-based Conservation Measures[2] (OECMs) which lie outside of traditional protected area networks are increasingly recognised as important tools lending further support towards achieving conservation goals and are included within the Arctic Council's 2015 Framework for a Pan-Arctic Network of Protected Areas (PAME, 2015a). There is no single agreed upon definition of the Arctic and for this paper, the Conservation of Arctic Flora and Fauna (CAFF) boundary is used to define the geographical extent of the Arctic. This covers 32.2 million km², 57 per cent (18.4 million km²) of which is marine and 43 per cent (14 million km²) terrestrial (Figure 1). It is important to note that some boreal forest is included within this boundary and is therefore included in the calculations presented in this paper (Figure 1).

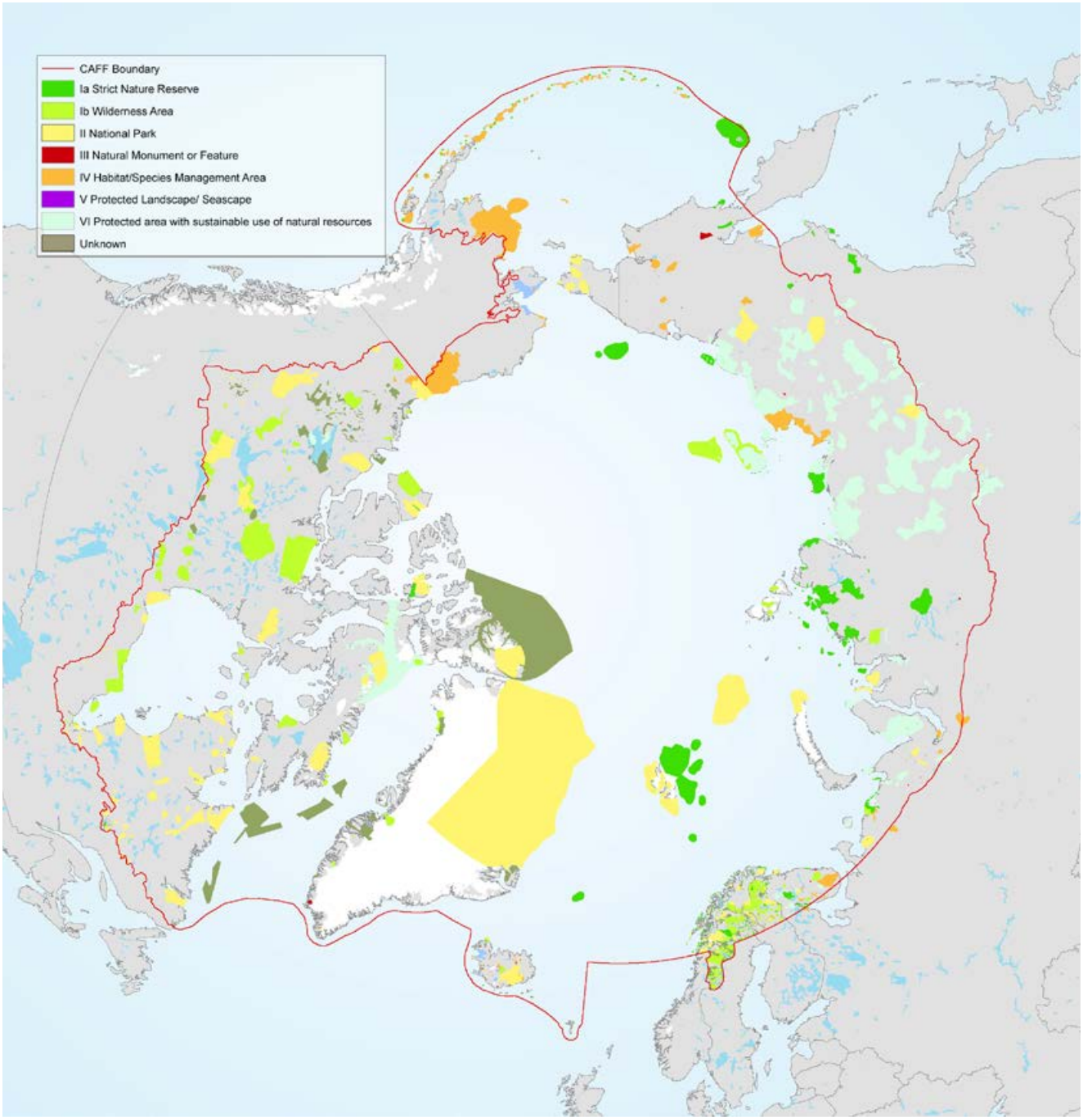

Figure 1. Protected areas in the Arctic classified by their IUCN Management Category, 2021. Due to scale not all protected areas are visible on maps in this report.

In the Arctic, both protected areas and OECMs are important for global biodiversity conservation as the majority of Arctic species use the region seasonally, with Arctic habitats providing resources for the maintenance of many bird and mammal species that migrate to areas around the world (Meltofte, 2013). The importance of this role is increasing due to climate-driven ecological change, industrial development, and resource exploitation (Barry et al., 2017). In recent years, Arctic states have through the Arctic Council[3] released a range of recommendations and products focused on advancing the protection of large areas of ecologically important Arctic habitats, building upon existing and ongoing domestic and international processes, and implementing appropriate measures for their conservation (Box 1). For example, the Council has identified ecologically and culturally sensitive marine areas with regards to shipping (AMAP/CAFF/SDWG, 2013); released a Framework for a Pan-Arctic Network of Marine Protected Areas (PAME, 2015a), conducted work on modelling Arctic oceanographic connectivity (PAME, 2021); and launched an initiative to provide an overview

A Fishing Boat in Greenland © Tony Skerl

of the current range and understanding of international criteria used for identification of OECMs in the Arctic marine environment (CAFF/PAME, 2021) and with plans in preparation by CAFF to launch a similar initiative focused on the terrestrial environment. These priorities are also reflected in Strategic Goal 2 Healthy and resilient Arctic ecosystems in the Arctic Council Strategic Plan 2021–2030 (Arctic Council, 2021) which is focused on promoting pollution prevention, conservation and protection of Arctic biodiversity, ecosystems, and species habitats; and both strategies have a range of associated strategic actions designed to achieve this goal (Box 2).

The pathways through which the Arctic Council can influence conservation change are through identifying actions and key advice needed in response to issues of concern. These can help inform changes in programmes, regulation, and policy to improve monitoring programmes to better understand changes in Arctic biodiversity. It does so through increasing common awareness and understanding of issues such as the challenges facing Arctic biodiversity; generating knowledge to support evidenced based decision making; addressing gaps in Arctic governance through facilitating creation of legal agreements; and providing a forum for communication in times of geopolitical tension (Barry et al., 2020a).

Through cataloguing the extent of protected areas across the Arctic and the trends regarding protected area establishment (including protected areas recognised under international conventions; and additional areas important for marine biodiversity), this paper contributes to tracking progress towards meeting Arctic Council goals and Aichi Biodiversity Targets 1 and 11 adopted in 2010 by Parties to the United Nations Convention on Biological Diversity (CBD) (Leadley et al., 2014), which have been replaced by Targets 2 and 3 under section 1 of the Kunming–Montreal Global Biodiversity Framework (GBF) to reduce threats to biodiversity and "Ensure that by 2030 at least 30 per cent of areas of degraded terrestrial, inland water, and coastal and marine ecosystems are under effective restoration, in order to enhance biodiversity and ecosystem functions and services, ecological integrity and connectivity (Target 2)" (CBD, 2022). This Target in turn contributes towards achieving the Sustainable Development Goals (SDG).

Box 1. Key Arctic Council recommendations and goals

The Arctic Council is an intergovernmental forum promoting cooperation, coordination and interaction among Arctic states, Indigenous peoples, and other Arctic inhabitants on issues of common importance. Member states include: Canada, Finland, Iceland, Kingdom of Denmark, Norway, Russia, Sweden, and the USA. Six organisations representing Arctic Indigenous peoples have status as Permanent Participants: Aleut International Association, Arctic Athabaskan Council, Gwich'in Council International, Inuit Circumpolar Council, Russian Association of Indigenous Peoples of the North, and the Saami Council. All Council decisions require consensus of the eight Arctic states who are obliged to consult the Permanent Participants on all decisions but ultimately it is the Arctic states who are the final decision makers (Barry et al., 2020b).

Arctic Biodiversity Assessment (ABA) (Meltofte, 2013):

- Rec5: Advance the protection of large areas of ecologically important marine, terrestrial and freshwater habitats, taking into account ecological resilience in a changing climate.
- Rec6: Develop guidelines and implement appropriate spatial and temporal measures where necessary to reduce human disturbance to areas critical for sensitive life stages of Arctic species that are outside protected areas, for example along transportation corridors. Such areas include calving grounds, den sites, feeding grounds, migration routes and mounting areas. This also means safeguarding important habitats such as wetlands and polynyas.
- Rec7: Develop and implement mechanisms that best safeguard Arctic biodiversity under changing environmental conditions, such as loss of sea ice, glaciers, and permafrost.

Arctic Marine Shipping Assessment (AMSA) (PAME, 2009):

- Rec2C: Arctic states should identify areas of heightened ecological and cultural significance in light of changing climate conditions and increasing multiple marine use and, where appropriate, should encourage implementation of measures to protect these areas from the impacts of Arctic marine shipping, in coordination with all stakeholders and consistent with international law.
- Rec2D: Arctic states should, taking into account the special characteristics of the Arctic marine environment, explore the need to internationally designate areas for the purpose of environmental protection in the regions of the Arctic Ocean. This could be done through the use of appropriate tools, such as 'Special Areas' or Particularly Sensitive Sea Areas (PSSA) designation through the International Maritime Organization (IMO) and consistent with the existing international legal framework in the Arctic.

Arctic Marine Strategic Plan (AMSP) (PAME, 2015b):

- Goal 2 Strategic Action 10: Develop a pan-Arctic network of marine protected areas, based on the best available knowledge to strengthen marine ecosystem resilience, and contribute to human wellbeing, including traditional ways of life.

Arctic Ocean Review (AOR) (PAME, 2013):

- Rec13: Arctic states should advance conservation of Arctic marine ecosystems by considering management measures in ecologically significant areas of the Arctic Ocean that Arctic states might pursue at the IMO, building on the results of the AMSA Recommendation II(D) Report on Specially Designated Arctic Marine Areas.

Framework for a Pan-Arctic Network of Marine Protected Areas (PAME, 2015a)**:**

- Goal 1: To strengthen ecological resilience to direct human pressures and to climate change impacts, to promote the long-term protection of marine biodiversity, ecosystem function and special natural and cultural features in the Arctic.
- Goal 2: To support integrated stewardship, conservation, and management of living Arctic marine resources and species and their habitats, and the cultural and social economic values and ecosystem services they provide.
- Goal 4: To foster coordination and collaboration among Arctic states to achieve more effective MPA planning and management in the Arctic.

Box 2. Arctic Council Strategic Plan 2021–2030: Goal 2 – Healthy and resilient Arctic ecosystems

Promote pollution prevention, monitoring, assessment, conservation and protection of Arctic biodiversity, ecosystems, and species habitats, based on best available science, and respecting the importance of sustainable development for all current and future generations of Arctic inhabitants;

2.1. Promote protection of the vulnerable Arctic ecosystems based on best available science and traditional knowledge and local knowledge, providing for conservation of biodiversity in the region, and supporting responsible use of its natural resources;

2.5. Promote action on issues that are critical to maintaining the health of Arctic ecosystems, as well as Arctic inhabitants, and encourage cooperation among Arctic states on ecosystem approach to management in the Arctic to advance conservation and sustainable use based on best available science;

2.6. Support work on protection and restoration of wetlands and habitats that are vital for Arctic species;

2.7. Support international efforts on conserving nature and biodiversity and providing Arctic, including Indigenous, perspectives on such efforts.

ARCTIC PROTECTED AREAS (MARINE AND TERRESTRIAL) OVERVIEW

Key findings

The extent of marine and terrestrial protected areas in the Arctic has doubled since 1980 (Figure 2). While progress has been made, it has not been evenly distributed across ecosystems and this paper does not analyse how well the suite of protected areas meets the test of being an "*ecologically connected, representative, and effectively managed network of protected and specially managed areas that protects and promotes the resilience of the biological diversity, ecological processes and cultural heritage*" (PAME, 2015a) of the Arctic. As of 2021, 20.77 per cent of the Arctic's terrestrial area and 5.24 per cent of the Arctic's marine areas are protected (Figure 2). Protected area coverage of the Arctic's terrestrial ecosystems exceeded Aichi Biodiversity Target 11 which aimed for at least 17 per cent of terrestrial and inland water to be protected by 2020. The protected area coverage of marine areas fell short of the Aichi Target for 10 per cent of coastal and marine areas to be protected. It is important to note that the terrestrial figures include some protected areas in the boreal forest. The current extent of protection on both land and sea falls short of GBF Target 3 to ensure that at least 30 per cent globally of land areas and of sea areas are conserved through effectively and equitably managed, ecologically representative, and well-connected networks of protected areas and OECMs. While neither Aichi Target 11 nor GBF Goal 3 specify exactly how these targets should be applied, using them for comparative analysis offers a useful tool to chart progress over time. While this paper addresses the coverage and extent of protected areas, Target 3 also requires that these networks of protected areas should be ecologically representative. Thus, while there is a need for a circumpolar analysis to consider the representativity and connectivity of the current network of protected areas in the Arctic, this lies outside the scope of this paper.

Status and trends

The first protected areas in the Arctic were established in Sweden and the United States at the beginning of the 20th century. The total Arctic area (marine and terrestrial) under protection remained low until the 1970s, when it began to increase with additions of large areas such as the Greenland National Park. Similarly, marine protected areas expanded significantly with the establishment by Canada of a number of new MPAs including the Tuvaijuittuq which covers 34 per cent of Arctic marine areas. By 1980, 5.6 per cent of the Arctic (marine and terrestrial) was classified under some degree of protection. This has steadily increased to the present when 11.96 per cent of the Arctic (marine and terrestrial), 3.87 million km², has protected status (Figure 2). Of the Arctic's marine areas, 5.24 per cent are protected and 20.77 per cent of its terrestrial areas fall within protected areas. The nature of protection and governance of these areas varies throughout the circumpolar region, and there are varying levels of protection within and among countries.

In 2021, over 88 per cent of all protected areas within the CAFF boundary had been assigned an IUCN Management Category. Protected areas falling into Category II, National Parks cover the largest total area while those in Category III, Natural Monuments or Features are the smallest. For marine and terrestrial areas, Category II is the most prevalent (see following sections for more detail). Figure 3a shows the extent of protected areas falling under each IUCN Management Category and Figure 3b the distribution of protected areas by their IUCN Management Category.

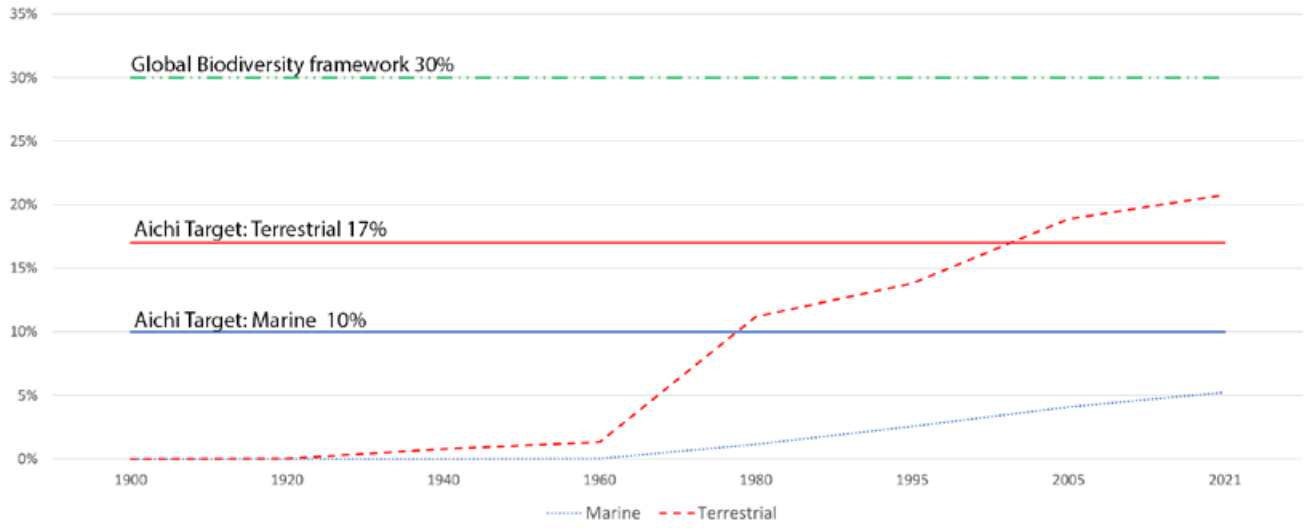

Figure 2. Trends in terrestrial and marine protected area coverage within the Arctic, 1900—2021, including the Aichi and GBF targets for protection of marine and terrestrial ecosystems.

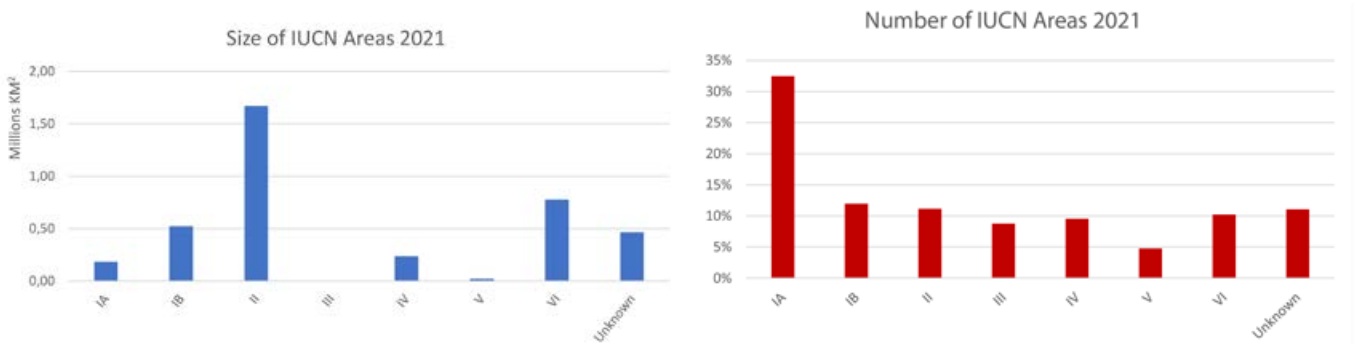

Figure 3. A) Extent of protected areas (marine and terrestrial) across each of the six IUCN Management Categories, 2021; **B)** Distribution of protected areas (marine and terrestrial) across each of the six IUCN Management Categories, 2021.

PROTECTED AREAS RECOGNISED UNDER INTERNATIONAL CONVENTIONS

Within the Arctic, there are 115 areas recognised under global international conventions. These include 12 World Heritage Sites (WHS)[4] (three of which have a marine component); 81 Ramsar Sites; and 22 protected areas under the Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR,) which together cover 1.25 per cent (404,258 km²) of the CAFF area (Figure 4). Between 1985 and 2020, the total area covered by Ramsar Sites[5] almost doubled, while the total area designated as World Heritage Sites increased by about 50 per cent in the same time period (Figure 5).

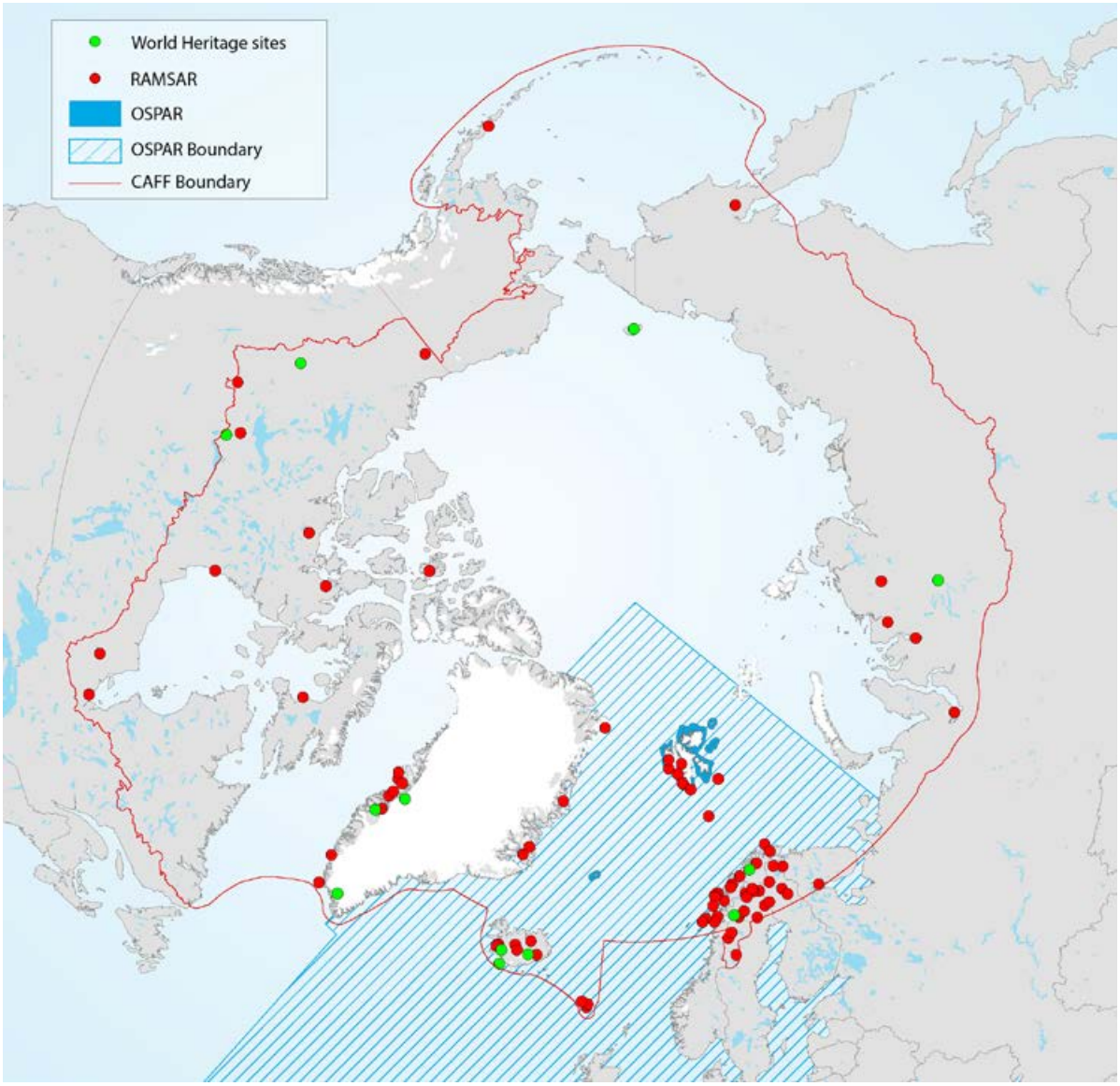

Figure 4. Distribution of Ramsar, OSPAR and World Heritage Sites within the Arctic, 2021. (Source: Ramsar, 2022; UNESCO, 2022).

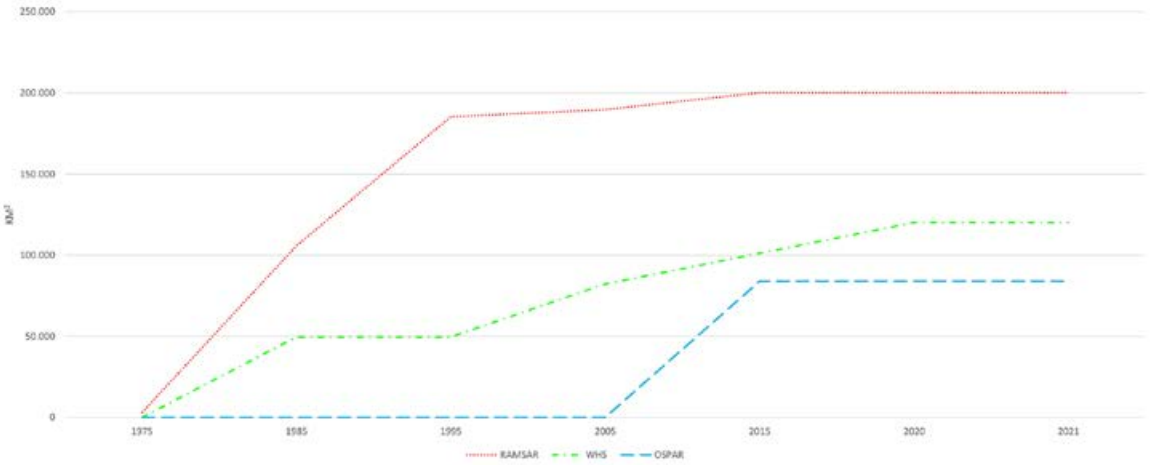

Figure 5: Changes in the total area of Ramsar, World Heritage Sites (WHS) and OSPAR protected areas within the CAFF boundary, 1975–2021 (Source: Ramsar, 2022; UNESCO, 2022; OSPAR, 2022),

MARINE PROTECTED AREAS

The extent of protected areas in the Arctic's marine environment (Figure 6) has increased almost five-fold since 1980 (Figure 7a). In 2021, over 5 per cent of the Arctic marine area (935,778 km²) was protected, which, when considered at a pan-Arctic scale, fell short of the Aichi Biodiversity Target 11 goal of 10 per cent of coastal and marine areas to be protected by 2020 (Figure 7a).

The marine protected areas are dominated by several very large areas with only 5.2 per cent of the 484 marine protected areas assigned an IUCN Management Category. Protected areas falling into Category IV, Habitat/Species Management Areas, cover the largest area overall. Figure 7b shows the percentage of protected areas in each IUCN Management Category in 2021.

Figure 6. Marine protected areas in the Arctic classified according to their IUCN Management Category, 2021.

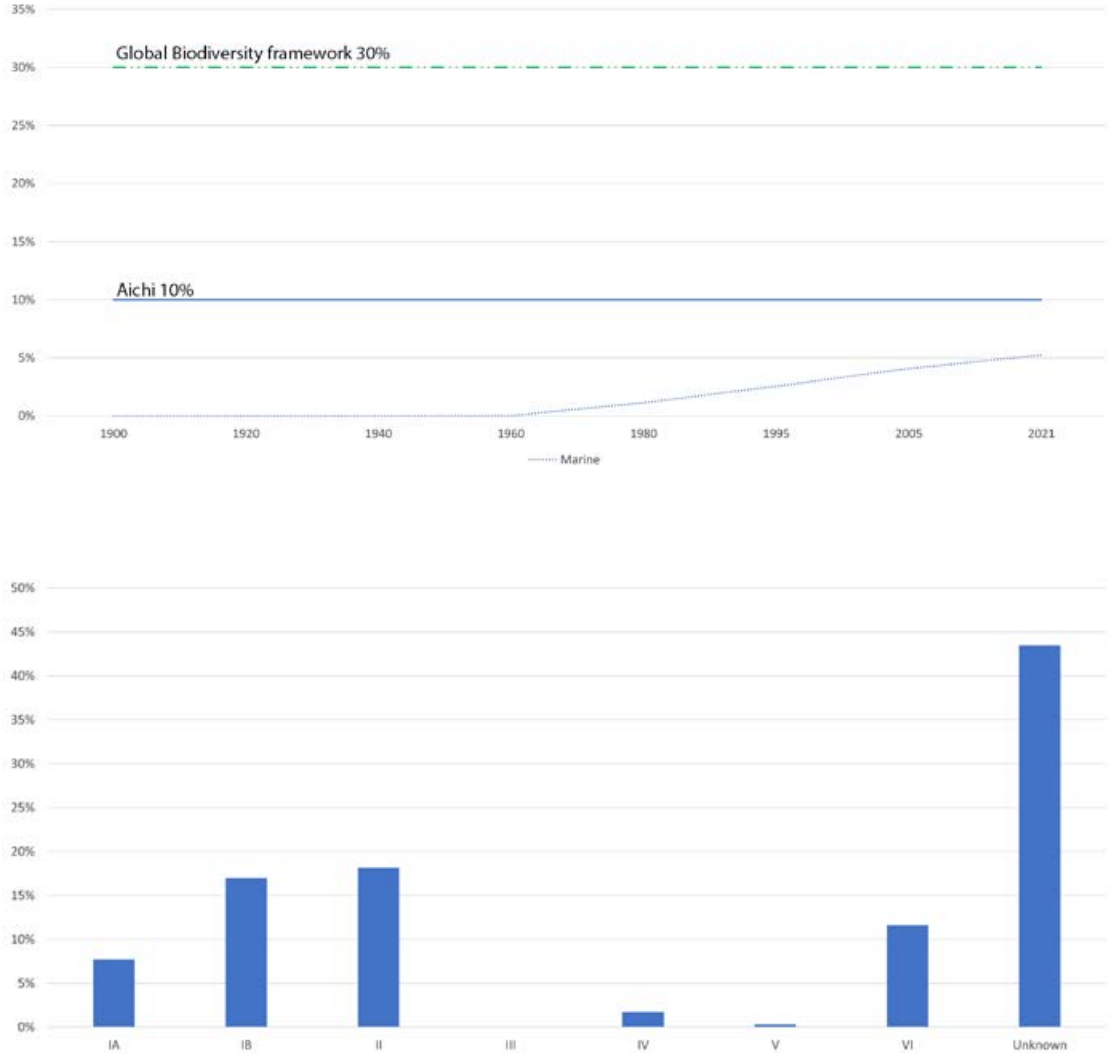

Figure 7. A) Trend in marine protected area coverage in the Arctic, 1900–2021; **B)** Distribution of marine protected areas across each of the six IUCN Management Categories, 2021.

OTHER AREA-BASED MEASURES IMPORTANT FOR ARCTIC BIODIVERSITY

In 2018, the CBD adopted a definition of OECMs, providing key elements for their identification and use across all ecosystems, complementing the IUCN definition of a protected area (Day, et al., 2019). Both measures contribute towards the long-term conservation of biodiversity with the difference being that the primary objective of a protected area is conservation, while an OECM may have many objectives (IUCN-WCPA, 2019). While this report focuses on protected areas, the Arctic Council has initiated a project to provide an overview of the current range and understanding of international criteria used for identification of OECMs in the Arctic marine environment; and to facilitate the exchange of information among Arctic Council members on the range of information and application of OECMs in the marine Arctic. Work is also underway to prepare a similar initiative focused on the Arctic terrestrial environment. Several Arctic states are currently identifying OECMs, and it is envisioned that future reports from the Arctic Council will include a status of OECMs in the Arctic (CAFF, 2021).

Area-based management tools are approaches that enable the application of management measures to a specific area to achieve a desired policy outcome. A wide variety exist, each with their own purpose, mandate and authority. For example, Particularly Sensitive Sea Areas (PSSA) are areas identified as needing special protection through action by the International Maritime Organization (IMO) to prevent, reduce or eliminate the threat or identified vulnerability from shipping. Another example Ecologically or Biologically Significant marine Areas (EBSA) are marine areas that support the healthy functioning of oceans and the services it provides. In

2008, the Parties to the CBD adopted scientific criteria for identifying EBSAs which supports the CBD's role in the work of the UN General Assembly with regards to marine protected areas beyond national jurisdiction (CBD, 2008). It does so through providing scientific and technical information and advice relating to marine biodiversity, including the application of ecosystem and precautionary approaches. In 2014, CBD workshops for the Arctic and the North-West Atlantic workshop identified EBSAs for the Arctic and confirmed that these areas fulfil the EBSA criteria (CBD, 2014a; 2014b). Fourteen EBSAs were identified, covering 4.2 million km², or 22.9 per cent of the Arctic marine area (Figure. 8). Less than 2.4 per cent of EBSAs lie within protected areas.

While there are currently no PSSAs designated within the Arctic, in 2013, the Arctic Council identified "Areas of heightened ecological and cultural significance" using IMO criteria for PSSA, which are similar to the EBSA criteria (AMAP/CAFF/SDWG, 2013). The term "areas of heightened ecological and cultural significance" comes from the Arctic Marine Shipping Assessment (PAME, 2009) which recommended "*That the Arctic states should identify areas of heightened ecological and cultural significance in light of changing climate conditions and increasing multiple marine use and, where appropriate, should encourage implementation of measures to protect these areas from the impacts of Arctic marine shipping, in coordination with all stakeholders and consistent with international law*". Through this process, 98 areas of heightened ecological and cultural significance were identified covering a vast area of approximately 14 million km² or 76 per cent of the Arctic marine area (Figure 8). The areas were identified primarily on the basis of their ecological importance to fish, birds and/or marine mammals (i.e., areas where large numbers of one or several species concentrate during particular times of the year, such as for breeding, feeding, staging or during migrations) (AMAP/CAFF/SDWG, 2013). Approximately 36 per cent (1.4 million km²) of these "areas of heightened ecological importance" lie within protected areas.

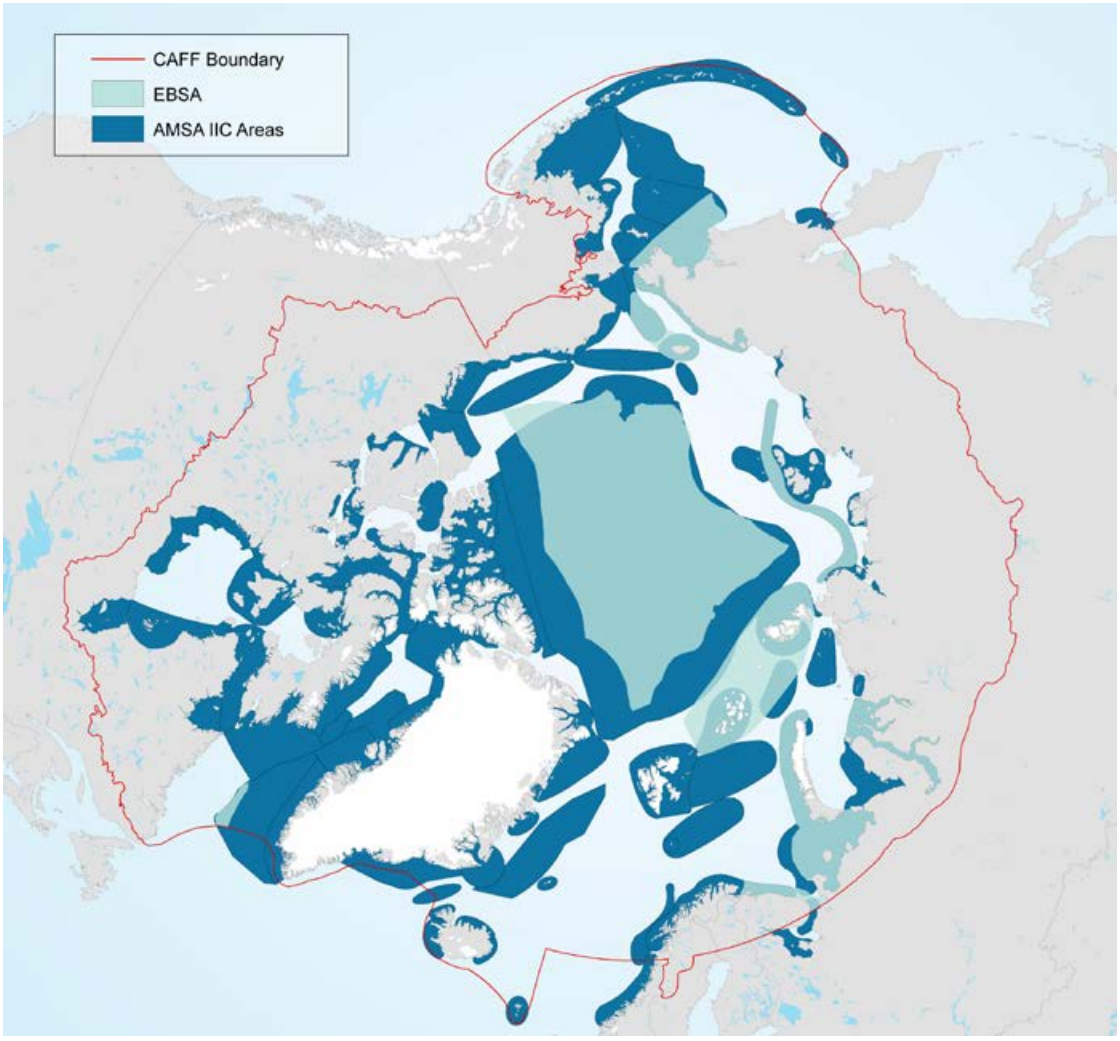

Figure 8. EBSAs (Source: CBD, 2022) and marine "areas of heightened ecological and cultural significance" (Source: AMAP/CAFF/SDWG, 2013).

Terrestrial protected areas

The extent of terrestrial protected areas within the Arctic (Figure 9) has almost doubled since 1980 (Figure 11). In 2021, 21 per cent (2.96 million km²) of the terrestrial area was protected. Protected area coverage exceeded Aichi Biodiversity Target 11, which aimed for at least 17 per cent of terrestrial and inland water to be protected by 2020 (Figure 10a). It is important to note that the terrestrial figures include some protected areas in the boreal forest and also that the percentage of terrestrial area protected includes one very large park in Greenland that protects just one type of ecosystem and covers more than one quarter of the entire area protected in the Arctic. Ninety-nine per cent of terrestrial protected areas have been assigned an IUCN Management Category. Protected areas in Category V (31.1 per cent), Protected Landscape/Seascapes, cover the largest area overall, while those in Category Ia, Strict Nature Reserves, cover 5.4 per cent of the total protected area. Figure 10b shows the distribution of protected areas across IUCN Management Categories in 2021.

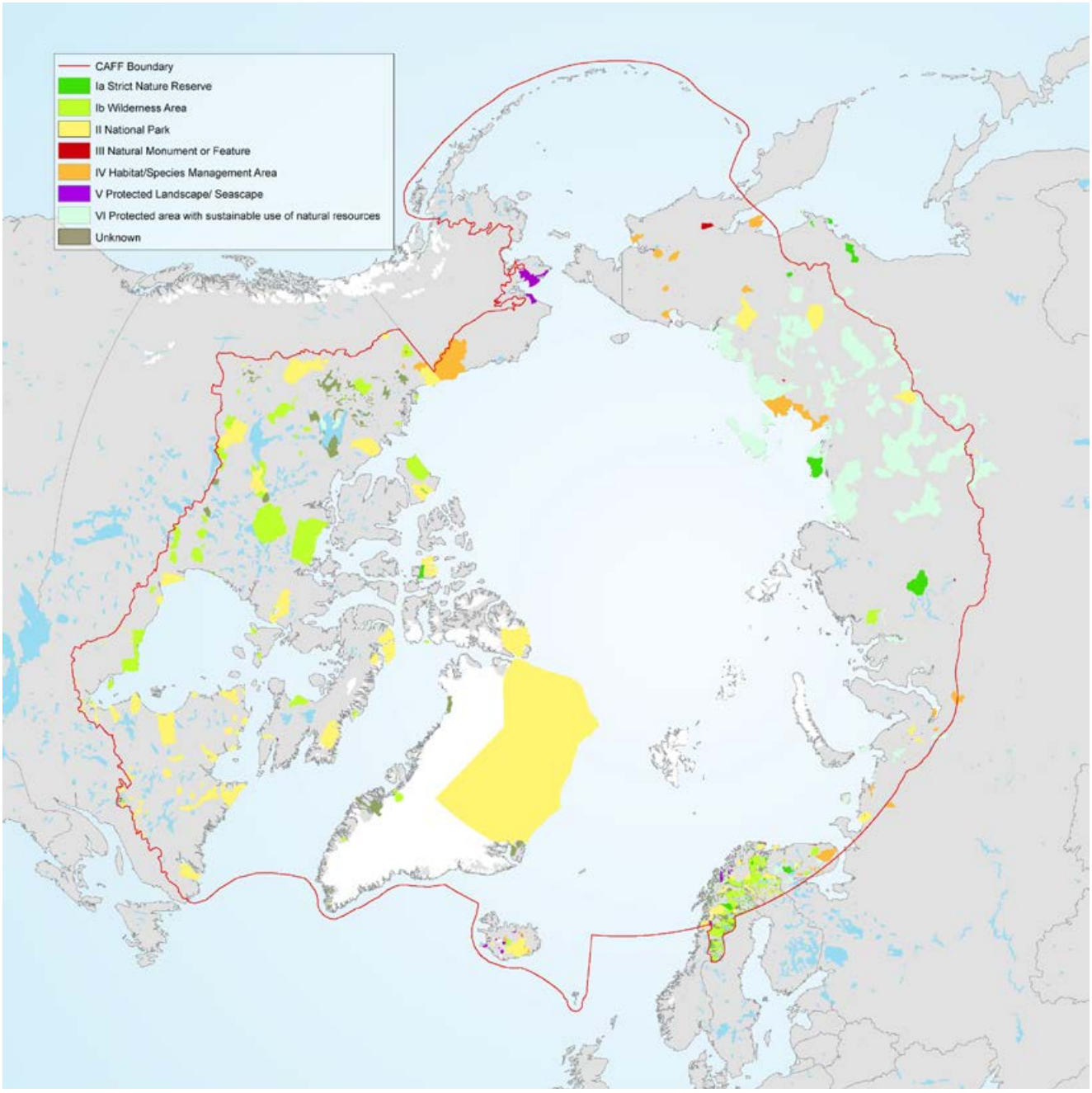

Figure 9: Terrestrial protected areas within the Arctic classified according to their IUCN Management Category, 2021.

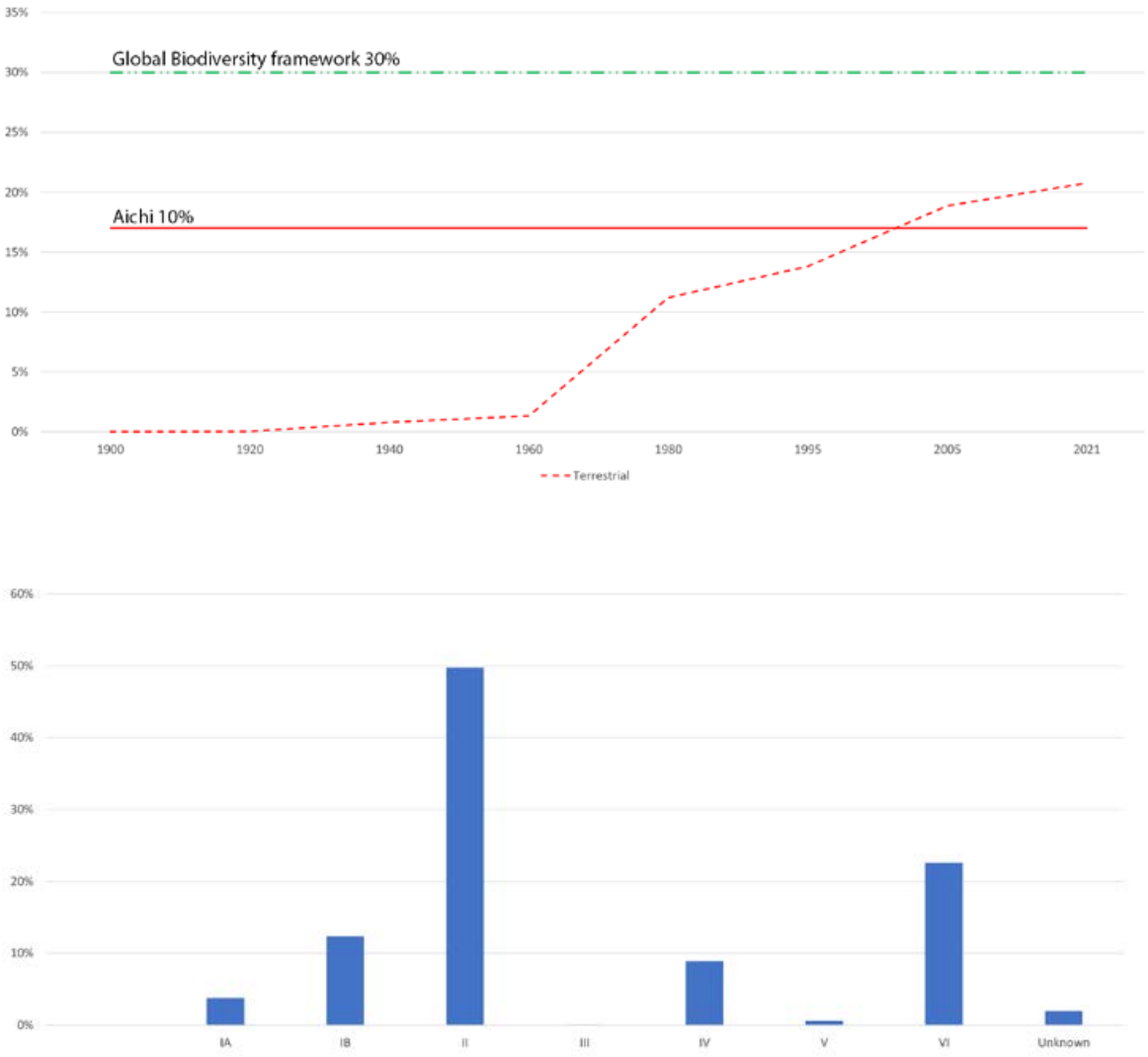

Figure 10: A) Trend in terrestrial protected area coverage in the Arctic, 1900–2021; B) Distribution of terrestrial protected areas across each of the six IUCN Management Categories, 2021.

Wetlands

Globally wetlands cover over 12.1 million km² of the Earth's surface (Ramsar, 2018) with 25 per cent found in the Arctic (Kåresdotter et al., 2021). These wetlands are globally important as wildlife habitats and migration pathways, and through the role they play in maintaining healthy ecosystems, biodiversity, carbon storage, water quality and other ecosystem services (CAFF, 2021). Therefore, effective management of the Arctic's wetlands, including conservation and restoration efforts, holds enormous potential to contribute to climate adaptation and mitigation, and conservation of biodiversity (CAFF, 2021). Almost all Arctic wetlands are found in permafrost areas, making them vulnerable to future temperature increases, with 18 per cent lying within protected areas and 82 per cent outside any protections that might contribute towards their conservation. Figure 11 highlights wetlands based on peat and mineral soils, where peatlands are found to be less protected (14.5 per cent) than other wetland areas (24.9 per cent of wetland areas in mineral soils). Protected peatlands are largely distributed towards the lower latitudes of the Arctic, while wetlands in mineral soils, in general are found at higher latitudes. As a consequence, if global warming is not kept in line with the climate scenario which predicts global average warming levels of 0.9 to 2.3°C by 2100, protected peatlands are projected to experience higher temperature increases in the future (Kåresdotter et al., 2021).

Comparing the RCP4.5 and RCP8.5 scenarios, protected wetland areas subject to high risk (risk ranking indices 4 and 5) increase from around 13/14 per cent (mineral/peat) to 16/35 per cent between 2050 and 2100. If the scenario RCP8.5 becomes a reality with global average warming levels of 3.2–5.4°C by 2100 then as

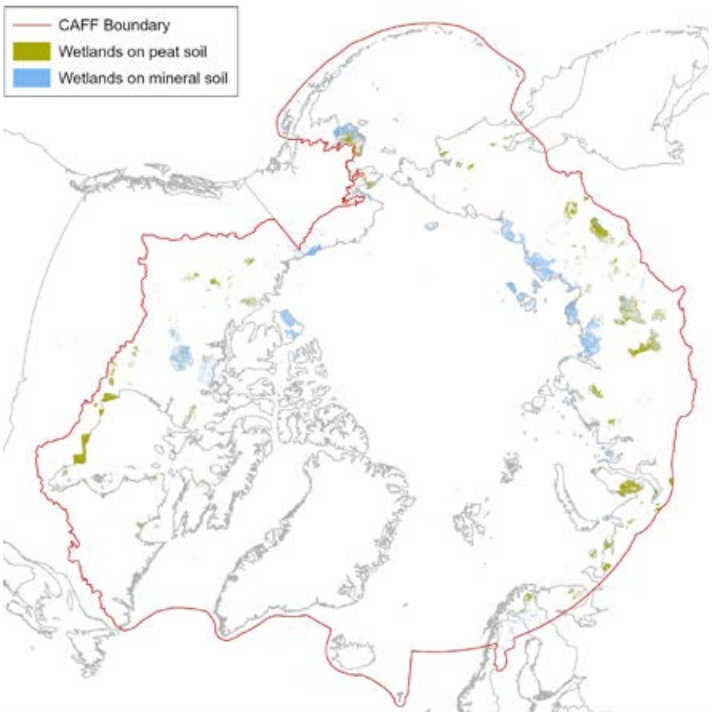

Figure 11: Wetlands based on peat and mineral soils, where peatlands (brown) are found to be less protected (14.5 per cent) than other wetland areas (24.9 per cent of wetland areas in mineral soils).

much as 45 per cent of Arctic wetlands would likely become highly vulnerable to regime shifts with negative impacts on human health, infrastructure, economics, and biodiversity (Kåresdotter et al., 2021). If, however, the RCP2.6 scenario could be realised, the risk for all protected wetlands is significantly lower, especially for peatlands (9 to 10 per cent in all years). This could be explained by the fact that this scenario affects temperature increases mostly in lower latitudes where peatlands are more prevalent. Although protection measures might not be able to limit temperature changes, wetlands will still constitute areas of special importance, and with less disturbances from other sources they are more likely to continue to provide important ecosystem services, even with changes occurring. As such, an important measure could be to increase wetland areas under protection. However, the best chance to limit potentially devastating impacts would be to limit future temperature increases.

CONCLUSIONS

The Kunming–Montreal GBF (CBD, 2022) contains a range of action-oriented targets for 2030 (see Supplementary Online Material 1), which will have significant impacts on how protected areas as a tool are used and reported upon within the Arctic. Similarly, the agreement on an international legally binding instrument under the United Nations Convention on the Law of the Sea (UNCLOS) on the conservation and sustainable use of marine Biodiversity of areas Beyond National Jurisdiction (BBNJ) will have significant impacts on how states deal with conservation measures for Arctic biodiversity. Complicating efforts to ensure a more robust framework to conserve Arctic biodiversity is uncertainty regarding how the mandate of the CBD will interact with the BBNJ agreement. Indications as to how Arctic states may respond to the new agreement can be discerned in the Reykjavík Declaration (Arctic Council, 2021) which specifies several areas of work directly relevant to marine biodiversity, notably Goal 3 and associated actions designed to achieve a healthy Arctic marine environment (see Supplementary Online Material 2) through promoting "*the conservation and sustainable use of the Arctic marine environment for the benefit of all current and future generations of Arctic inhabitants, encourage safety at sea, prevention of marine pollution and cooperate to improve knowledge of the Arctic marine environment, monitor and assess current and future impacts on Arctic marine ecosystems, work together to enhance cooperation on marine issues and promote respect for the rule of law and existing legal frameworks applicable to Arctic waters*" (Arctic Council, 2021, page 14).

Building upon activities described in this paper, work is already underway to develop an overview of the current range and understanding of international criteria used for identification of OECMs in the Arctic (CAFF/PAME, 2021). This will also facilitate a dialogue about how Arctic Council members are interpreting and applying the OECM definition and criteria in the Arctic. The role of Indigenous sustainable management practices, including Indigenous protected and conserved areas, and other Indigenous stewardship measures, and their contribution to effective marine stewardship will also be explored in the Arctic context, and could be expanded upon in future work by the Arctic Council. Key strategic steps in guiding how states may address Arctic biodiversity issues and conservation measures include development of a new Action Plan for Biodiversity 2023–2030 which is being developed to align with the Kunming–Montreal Global Biodiversity Framework to facilitate reporting on how the Arctic is responding to global biodiversity goals and targets and supporting achievement of the SDG.

While the various instruments and processes mentioned in this paper are being developed or implemented, the Arctic continues to face growing ecological challenges. At this critical juncture, ensuring a robust framework for the conservation of Arctic biodiversity and ecosystems is ever more urgent. The current framework for the protection of BBNJ´s in the Arctic was perceived as

North deer on snowy meadow in winter, Inari, Finland © Francesco Ungaro

insufficient to tackle the challenges posed by the impacts of climate change and increasing human activity (Prip, 2022) and it remains to be seen whether the current efforts at the regional and global scale will be sufficient to ensure adequate conservation measures are put in place. Complicating the situation is the increasing geopolitical importance of the Arctic and the resultant increase in military activities in the region; and the impacts of broader conflicts, as can be seen in the suspension of the work of the Arctic Council due to the war in Ukraine. How this suspension of cooperation between Russia and the other Arctic states will impact upon Arctic conservation remains to be seen, but the impact on scientific cooperation across the region may have long-term consequences for our ability to understand what is happening in the Arctic and formulate proactive measures in response.

ENDNOTES

[1] There is no single agreed-upon definition of the Arctic and for the purpose of this paper, the CAFF boundary is used to define the geographical extent of the Arctic. This covers 32.2 million km^2, 57 per cent (18.4 million km^2) of which is marine and 43 per cent (14 million km^2) terrestrial (Figure 1). It is important to note that some boreal forest is included within this boundary and is therefore included in the calculations presented in this paper.

[2] An OECM is 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' (CBD Decision 14/8, 2018).

[3] The Arctic Council is the primary intergovernmental forum promoting cooperation, coordination and interaction among Arctic states, Indigenous communities, and peoples. Established in 1996, the Arctic Council focuses on environmental protection and sustainable development and has evolved into a forum with both regional and global implications. It is a consensus forum comprised of eight member states (Canada, the Kingdom of Denmark (including Greenland and the Faroe Islands), Finland, Iceland, Norway, Russia, Sweden and the United States); six Indigenous organisations known as Permanent Participants (Aleut International Association, Arctic Athabaskan Council, Gwich'in Council International, Inuit Circumpolar Council, Russian Association of Indigenous Peoples of the North, and the Saami Council) and thirty-eight Observer states and organisations. It has no ability to enforce a member state or organisation to implement any of its guidelines, advice or recommendations, which remain the responsibility of member states and organisations (Arctic Council, 2013). The Permanent Participants sit at the same table as the member states and can intervene and speak according to the same procedures applied to member states. The Arctic states are obliged to consult

them on all the Council's negotiations and decisions but ultimately it is the Arctic states who are the final decision makers (Barry et al., 2021).

[4] World Heritage Sites are cultural and/or natural sites considered to be of 'Outstanding Universal Value', which have been inscribed on the World Heritage List by the World Heritage Committee (UNESCO, 2022).

[5] Ramsar Sites are designated because they meet the Criteria for identifying Wetlands of International Importance. The first criterion refers to sites containing representative, rare or unique wetland types, and the other eight cover sites of international importance for conserving biological diversity (RAMSAR, 2022).

SUPPLEMENTARY ONLINE MATERIAL

1. Action-oriented targets from the Kunming-Montreal GBF
2. Extracts from Reykjavík Declaration

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RESUMEN

Este documento ofrece una actualización de la situación de las áreas protegidas del Ártico en 2017. Ofrece una visión general del estado y las tendencias de la extensión de las áreas protegidas en el Ártico y una visión general de las medidas de conservación basadas en áreas, incluidos los sitios del Patrimonio Mundial y los humedales. Este documento utiliza la definición de áreas protegidas de la Unión Internacional para la Conservación de la Naturaleza (UICN), que incluye una amplia gama de categorías de gestión, desde reserva natural estricta hasta protección con uso sostenible. En consecuencia, el nivel de protección y gobernanza de estas áreas varía en toda la región circumpolar. En 2021, el 20,77% de la superficie terrestre del Ártico y el 5,24% de sus zonas marinas estaban protegidas. La cobertura de áreas protegidas de los ecosistemas terrestres del Ártico superó la Meta 11 de Aichi para la Diversidad Biológica, que pretendía que al menos el 17% de las aguas terrestres e interiores estuvieran protegidas para 2020. La cobertura de las zonas marinas protegidas no alcanzó la Meta de Aichi de proteger el 10% de las zonas costeras y marinas.

RÉSUMÉ

Ce document fait le point sur l'état des zones protégées de l'Arctique en 2017. Il donne un aperçu de l'état et des tendances de l'étendue des zones protégées dans l'Arctique et une vue d'ensemble des mesures de conservation basées sur les zones, y compris les sites du patrimoine mondial et les zones humides. Ce document utilise la définition de l'Union internationale pour la conservation de la nature (UICN) pour les zones protégées, qui comprend un large éventail de catégories de gestion - de la réserve naturelle stricte à la protection avec utilisation durable. Par conséquent, le niveau de protection et de gouvernance de ces zones varie dans la région circumpolaire. En 2021, 20,77 % des zones terrestres et 5,24 % des zones marines de l'Arctique seront protégées. La couverture des écosystèmes terrestres de l'Arctique par des zones protégées a dépassé l'objectif 11 d'Aichi pour la biodiversité, qui prévoyait qu'au moins 17 % des zones terrestres et des eaux intérieures soient protégées d'ici à 2020. La couverture des zones marines protégées n'a pas atteint l'objectif d'Aichi, qui prévoit la protection de 10 % des zones côtières et marines.

ASSESSING THE ADAPTIVE MANAGEMENT PROCESS IN SMART SITES: LESSONS LEARNED

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ABSTRACT

The effective management of protected and conserved areas is crucial to the preservation of much of the world's biodiversity. The Spatial Monitoring and Reporting Tool (SMART) is one of the world's most utilised protected and conserved area management tools, used to inform research, tourism management, natural resources use, intelligence, threat analyses, and more. Through surveying staff at 49 protected and conserved areas across 14 countries, we examine how SMART is being implemented in terms of eight key factors in data management and decision-making. Results indicate room for improvement in all aspects of the adaptive process, particularly relating to the planning of systematic patrols as well as the role of management in the adaptive process. Additionally, many sites provide low levels of training and suffer from insufficient staffing. This information will help develop guidance on what is required by protected and conserved areas for the effective implementation of SMART.

Key words: Protected and conserved areas, ranger-based monitoring, Spatial Monitoring and Reporting Tool (SMART), conservation management, biodiversity

INTRODUCTION

Protected and conserved areas (PCAs) cover an increasing proportion of the Earth's surface, currently 17.13 per cent of terrestrial and inland waters (UNEP-WCMC & IUCN, 2023). Given their importance in conserving the planet's declining wildlife populations (WWF, 2020), it is crucial that PCAs are well managed. Effective management must address region or site-specific elements, such as responses to pressures and threats, social contexts, governance types and accountability. Crucially, it also relies on resilience to changing conditions and situations, meaning PCAs can benefit from adaptive management approaches (Agrawal, 2000; Prato, 2009), defined as the systematic acquisition and application of reliable information to improve management over time (Walters, 1986). Therefore, it is essential that management acquires necessary data on the conditions and interventions at ground level.

PCA and ranger-based monitoring tools may be used to obtain a consistent flow of this important information. These tools were developed to assist conservation practitioners in plugging information gaps as well as assisting in the implementation of adaptive approaches to management (Cronin et al., 2021; Stokes, 2010). By far the most widely used is the Spatial Monitoring and Reporting Tool (SMART) developed by the SMART Partnership. Current SMART Partnership members are: Frankfurt Zoological Society, Re:wild, North Carolina Zoo, Panthera, Peace Parks Foundation, Wildlife Conservation Society, Wildlife Protection Solutions, World Wildlife Fund, and Zoological Society of London. The SMART has grown from its origins as a law enforcement monitoring tool to become a globally used conservation management data tool (SMART, 2021). As a fully developed software platform, it offers tools for ranger-based data collection, storage and analyses. It is used to accurately record wildlife signs, patrol routes and illegal activities, and standardises this data to then create easily accessible information for use in maps, analyses and technical reports to aid and inform adaptive decision-making processes. SMART is used in 80 countries

around the world and is deployed in over 1,000 known conservation sites, ranging from large national parks to smaller community conservancies. It informs research, tourism management, natural resources use, intelligence, and performance and threat level assessments for protected and conserved areas (SMART, 2021).

A 'SMART patrol' approach (Stokes, 2010; SMART, 2021) centred around an adaptive framework has some generally agreed upon components (see Figure 1). The adaptive approach to conservation management is conceived of as an iterative feedback loop where data drives decision-making with continuous adaptation to change. The adaptive approach when utilising SMART will vary from site-to-site and drive continuous improvement. While many sites are implementing and using SMART for the purpose of improving patrolling and PCA management (SMART, 2021), there remains little understanding about how well these sites are implementing SMART. Studies evaluating SMART at individual sites suggest that SMART has helped to improve patrol results (Critchlow et al., 2016; Dancer, 2019; Hötte et al., 2016; Wangmo et al., 2021) and reduce threats (Duangchantrasiri et al., 2016; Wangmo et al., 2021). However, other studies demonstrate the deterrence effect of SMART patrols is weak and there is inconsistency in its implementation by management (Dancer, 2019). There has been little evaluation of a more general nature of how SMART is being implemented across the world, and where in the adaptive cycle sites are struggling most.

Table 1. An overview of the number of sites and total years of SMART implementation per country.

Countries	Number of sites	Years of implementation
Tanzania	1	0.5
Myanmar	6	1
Pakistan	2	1
Mongolia	1	1
China	10	3
Uganda	1	3
Laos	1	4
Kenya	4	4
Bhutan	6	5
Vietnam	2	5
Thailand	4	5
Indonesia	5	5
Malaysia	3	5
Cambodia	3	6

METHODS

To gain a better understanding of how SMART is being implemented and where the primary challenges arise, this study surveyed 49 sites across Asia and Africa. The survey captured eight main aspects of the adaptive management approach and related these to timelines for successful implementation across a maximum of six years. Factors achieving success in a short timeframe were of particular interest.

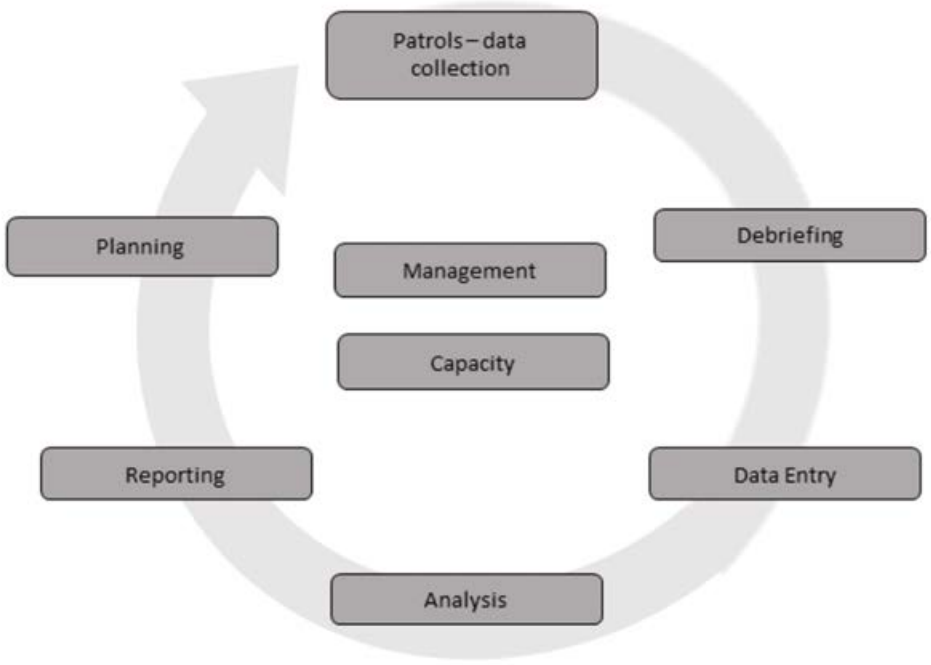


Figure 1. A simple adaptive management approach to using SMART to enhance 'management' and 'capacity'.

Asia and Africa were chosen for analysis due to a long history of SMART implementation. All sites were recruited through the WWF global network. SMART sites were defined as a single protected or conserved area, such as a national park, wildlife sanctuary or conservancy, that is implementing the SMART approach. Surveys were conducted for 49 SMART sites over two months in 2020, spanning the 14 countries below (Table 1).

The survey was used across sites and designed in consultation with SMART users on the ground and experts involved in supporting SMART implementation. The survey comprised nine sections, the first covering site identification data, country, and landscape, and the other eight covering aspects and levels of support for SMART implementation (Figure 1):

1. Staffing & Capacity (5 items)
2. Data Collection (4 items)
3. Data Entry (3 items)
4. Debriefing (1 item)
5. Analysis (3 items)
6. Reporting (3 items
7. Planning (3 items)
8. Management (3 items)

A total of 25 items utilised a mix of yes/no responses weighted 0 for 'no' and 1 for 'yes' plus a set of Likert scales ranging from 3 to 11 points. All eight scales were averaged and summed to produce a ninth aggregated 'total' score per site, per country. Most scales had key items focusing on frequencies of implementation of each aspect of the SMART approach using the following responses: 'never', 'as required' and 'monthly' (Appendix 1).

The surveys were completed by non-governmental organisation (NGO) staff along with input from local authorities. The process relied on self-reporting between the NGO and local management after a briefing or explanation by the survey team to local staff.

The relationship between the duration of SMART implementation and the aggregated total score was assessed by a Pearson product-moment correlation coefficient test using R (Studio version 2021.09.2+382). For sites with sufficient data, such as long-term consistent threat and wildlife observation data, background exploratory analyses also looked at types of enabling conditions that improved protection outcomes when total scores were similar. This was available for only two sites.

In addition to scoring sites based on the questions for each aspect of the SMART adaptive approach, the survey sought to understand numerous important aspects of SMART implementation such as levels of training received by patrol staff.

RESULTS

An overall picture of SMART implementation was developed by aggregating the results across the entire sample to see which of the eight aspects of implementation were performing best (Figure 2). As can be seen, 'reporting' was the highest performing

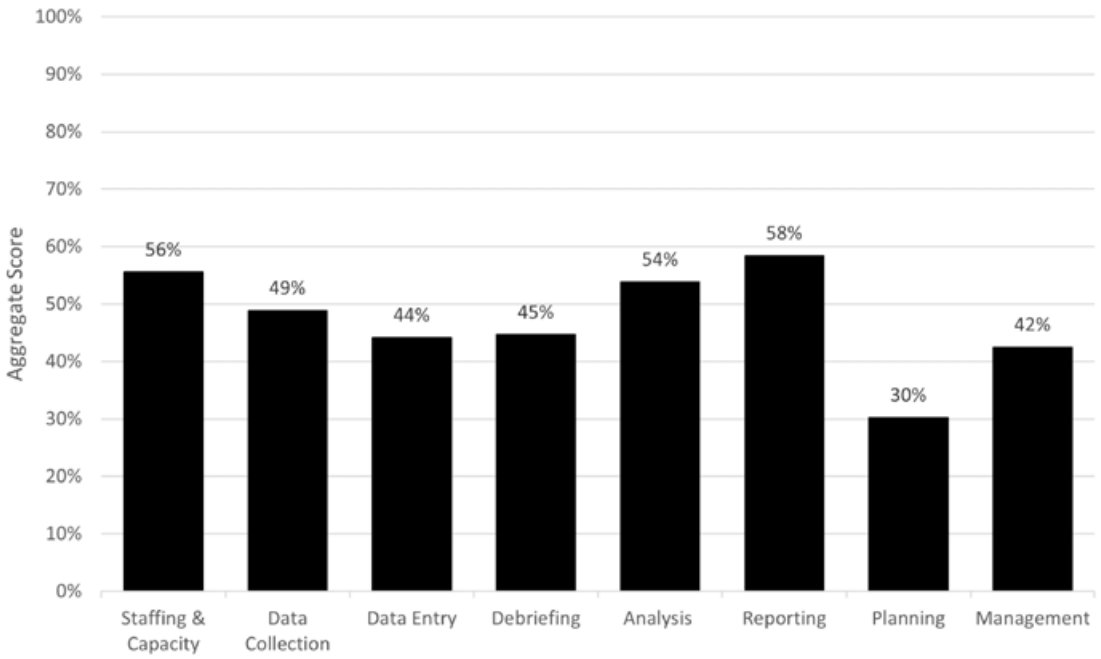


Figure 2. Assessment of each aspect of the SMART approach from sites in Africa and Asia

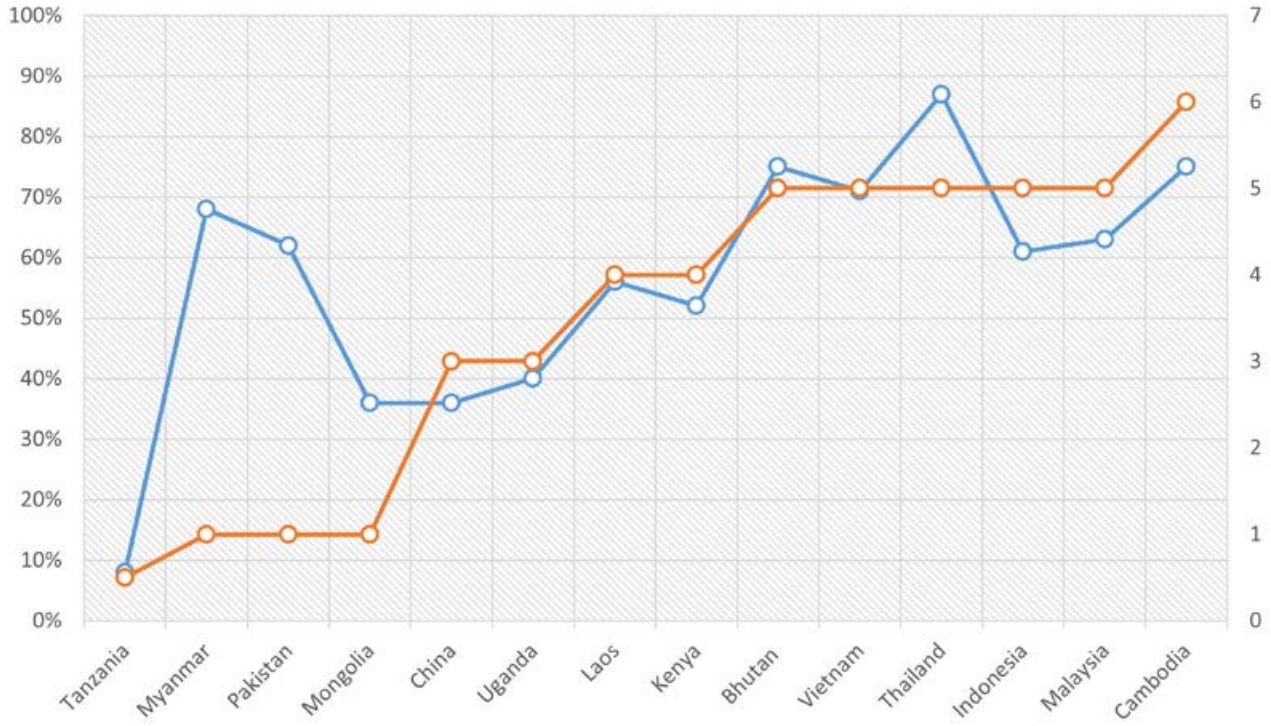


Figure 3. Mean site scores for each country compared with the mean number of years of SMART implementation demonstrating a correlation between duration of implementation and performance from sites in Africa and Asia

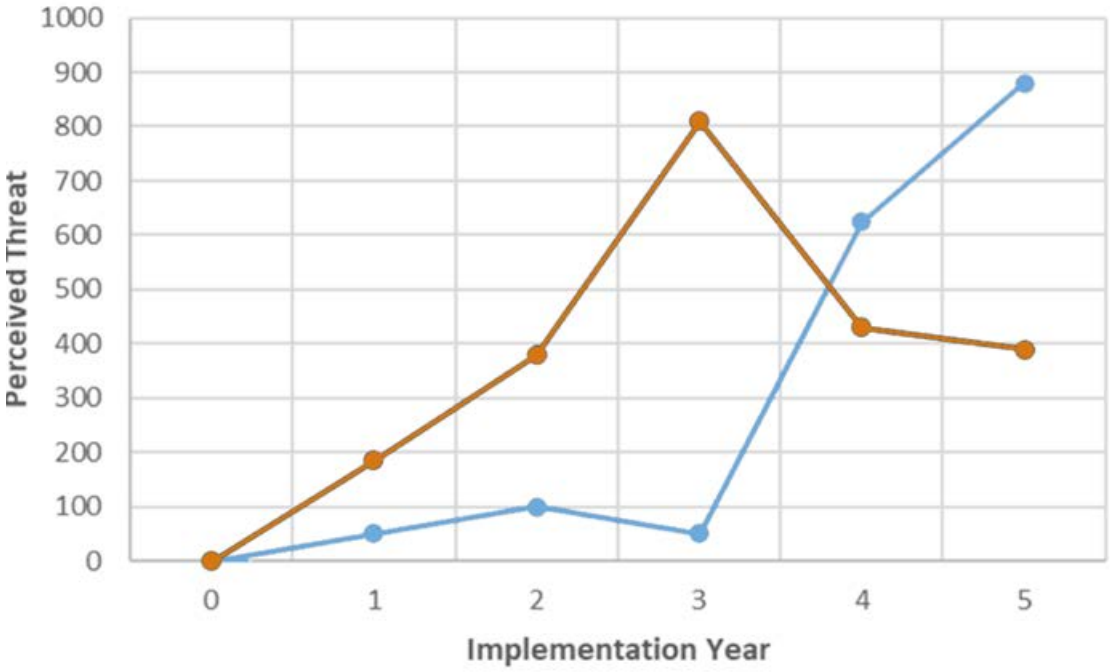


Figure 4. For SMART implementation, perceived threat falls after three years under good enabling conditions in one site yet continues to rise under poor enabling conditions in the other site

Ranger doing fire management in Loita Forest in the Mara landscape, lower Loita, Kenya © Ami Vitale / WWF-UK

aspect, with 'management and planning' performing considerably worse than others. All aspects scored below 60 per cent, suggesting significant room for improvement.

Most sites do not employ a full-time data officer, and 56 per cent of sites indicated that their designated SMART officer/administrator was spending less than 50 per cent of time on SMART-related activities. In only 9 per cent of sites, all frontline staff (rangers and community patrol members) were trained in data collection. Most sites are not conducting regular refresher training to staff, with only 44 per cent indicating these are conducted annually. 64 per cent do not have written protocols for SMART. Also key to the SMART adaptive approach is the use of data in patrol reports to plan future patrolling activities. Only 39 per cent produce such reports regularly, an additional 46 per cent indicating only 'sometimes'.

Duration of implementation was chosen for reporting because it displayed a significant positive correlation with the 'total score' that encapsulated all eight subscales, reflecting improvement with time as would be expected. The eight subscales were not correlated with time of SMART implementation, only the total score.

The second analysis consisted of the total scores, analysed per country (ranging from 8 per cent to 87 per cent, M=56 per cent, SD=0.21 per cent), and revealed a very positive correlation between duration of implementation (ranging from 6 months to 6 years, M=3.5 years, SD=1.8 years) and total score (Pearson's $r = 0.648$, $p = 0.01$). This suggests sites with a longer history of implementation performed significantly better than sites that had more recently adopted the tool. Despite this strong correlation, two nations, Myanmar and Pakistan, achieved high total scores, both in the 60s, despite implementation times as short as one year at the time of survey (Figure 3).

Notwithstanding, there is clearly much room for improvement in implementation. The weakest aspects were 'planning' (30 per cent), 'management' (42 per cent), 'data entry' (44 per cent) and 'debriefing' (45 per cent), mostly centred on process variables. Whereas the strongest, like 'data collection' (49 per cent), 'analysis' (54 per cent), 'staffing and capacity' (56 per cent) and 'reporting' (58 per cent) centred on analytic variables. It should be noted that the 'planning' aspect of the survey contained questions requiring a SMART Planning Plugin which is generally underutilised in the software tools. The survey also identified that the majority of sites do not have a full-time data officer, and only 25 per cent of sites employ an officer capable of utilising the full suite of analytical tools at the data officer level. This is notable since the full-time data officer is responsible for data management of SMART, though from these results

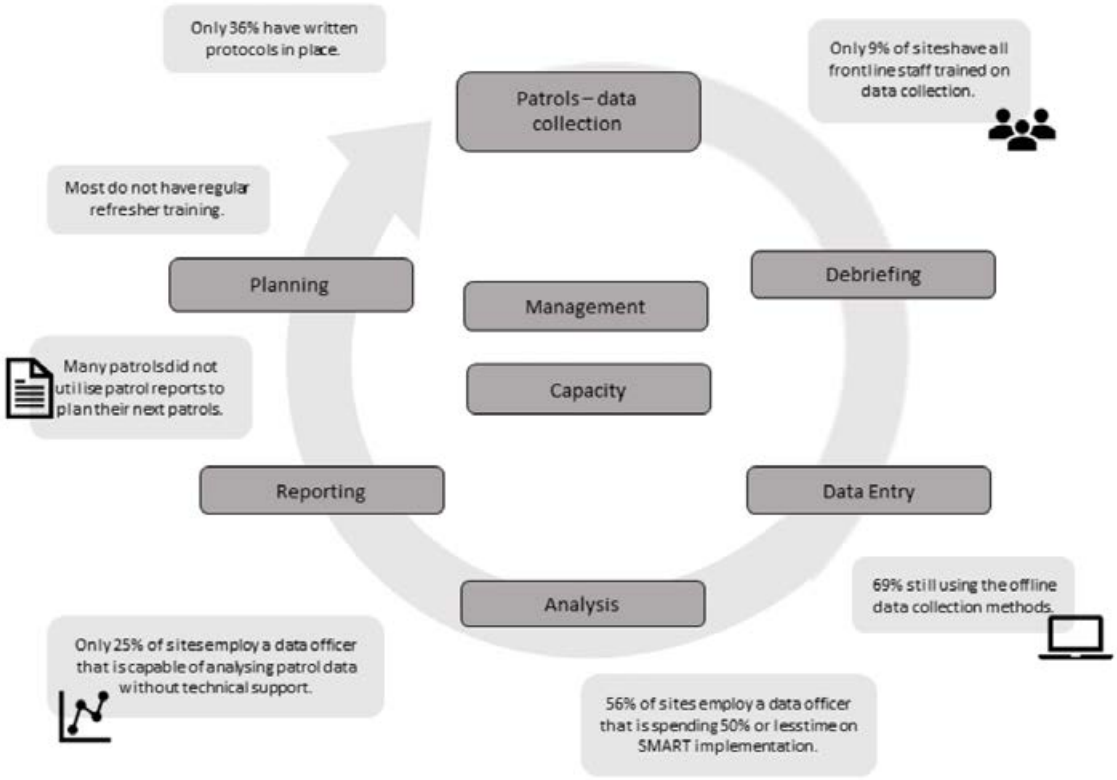


Figure 5. Overview of the SMART adaptive approach and key results.

it can be suggested that most data officers in the study sites were underutilised and undertrained, potentially impacting the implementation results of SMART. This needs further investigation to confirm this hypothesis, and to suggest improvements for management structures of staff utilising SMART. A summary of the key findings is shown in Figure 5.

Detailed time series data was available for two intentionally unidentified sites that also included data on perceived threat, defined as the number of recorded 'threat' observations over time. These two sites also happened to have opposing profiles for enabling conditions, allowing direct time series comparison between the two. Enabling conditions include levels of governance, management and investment. One site has strong enabling conditions and the other has poor enabling conditions. When compared (Figure 4), perceived threat only falls under strong enabling conditions and this only after three years of SMART implementation. It should be noted that this comparison relies only on two sites and the differences in threat reduction could be due to numerous other factors.

DISCUSSION

This survey-based exploration of SMART implementation across 49 sites and 14 nations in Asia and Africa uncovered three main findings. The first is there is significant room for improvement across all eight aspects of implementation, given that none of them reached scores much higher than 60 per cent. The second was that implementation time across years correlated significantly with aggregated total scores. This means that achieving a high level of SMART implementation takes time. The scatter around the trend line is tight except in the cases of Pakistan and Myanmar, both of which achieved high total scores despite having only a year of implementation experience. The reasons behind their unusual ability to achieve scores more akin to nations with five years' experience deserves further exploration. The third main finding was that 'perceived threat' as a major outcome variable can dramatically fall after three years of SMART implementation but only under good enabling conditions, here defined as strong management, governance and investment. This confirms the second finding by suggesting 1–3 years of SMART

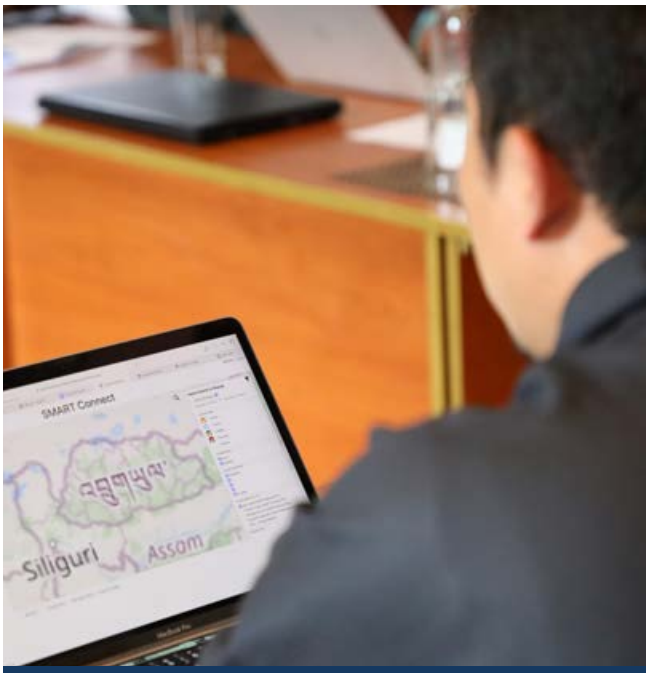
A group of female rangers out on patrol in Sarpang Forest Division in Bhutan © Rohit/Singh/WWF US

implementation might be the minimum requirement for positive outcomes. This is because the data suggests a trend for the sites per country to achieve maximum efficiency around 3 years of SMART implementation, except in the case of Pakistan and Myanmar which were outliers achieving success within only six months.

Challenges

Given that SMART is implemented in 1,000 PCAs around the world (SMART, 2021), it is imperative to understand the challenges in achieving an adaptive approach to SMART implementation. By understanding gaps in implementation, management and conservation outcomes can be optimised (Powlen et al., 2021). The uptake of SMART can be viewed as a positive step by PCAs, offering an evidence base for holistic management processes and even for other tools such as, for example, the management effectiveness tracking tool (METT) and Conservation Assured (Dudley et al., 2020; Hockings et al., 2021; Stolton et al., 2021). Moreover, SMART directly empowers site staff with information to improve patrol decisions (Dancer, 2019; Hötte et al., 2016; Wangmo et al., 2021) and conservation results, such as a reduction of threats to biodiversity and population recovery (Duangchantrasiri et al., 2016; Wangmo et al., 2021). But as conceptualised in the SMART adaptive approach (Figure 1), this process relies on multiple layers for effective implementation. From field staff, such as rangers, to higher level management, each has a role to play in the effective use of the tool, and each level requires different skill sets and competencies. Therefore, the effectiveness of the implementation of SMART relies heavily on how it is implemented. Simply adopting SMART in a PCA will not yield positive conservation or management outcomes without this crucial consideration, especially when regarding training and data handling, and adaptive action that is a continuation of the management process based on information by SMART.

In many studies, positive outcomes have relied on the enabling conditions present in field (Arthur, 2021; Fox et al., 2013; Lockwood, 2010). Without sufficient consideration and support from local authorities, for example, it is unlikely that SMART implementation will be effective in producing positive outcomes. This is perhaps demonstrated by those sites with more recent implementation scoring better than some of those with longer histories of SMART use, although this could also be a result of significant hands-on support and guidance from experts during initial phases of implementation. Enabling conditions include governance structures,



Rangers learning SMART Connect in Bhutan © WWF Bhutan

accountability mechanisms and the general commitment to conservation by local or national governments (Porter-Boland et al., 2012). This also extends to adequate funding to effectively manage PCAs and implement SMART, crucial for ensuring sufficient staffing and equipment for field teams. As seen in the survey results, many sites suffer from low levels of training and in-house capacity as well as a limited use of SMART outputs in the form of reports. A lack of training, in-house capacity or written protocols at a site, for example, extends beyond SMART implementation and may be more of a reflection of wider shortcomings or operational procedural differences between sites. These factors remain relevant to assessment results. Further study could investigate whether these factors are consistent over time, and further research could assist in developing management strategies accordingly.

Despite some concerns over the capacity of staff to effectively implement an adaptive SMART approach, the results indicate that some of the more complicated aspects of the software application, such as analysis and reporting, scored relatively well. Many PCAs covered in the survey receive support from non-governmental conservation organisations for capacity building at the 'data officer/administrator' level. 'Planning' and 'management', which scored relatively poorly, are aspects that rely on individuals working at different levels, such as PCA managers. Limited SMART-focused training has been directed at this level and there is a poor understanding of the competencies required at all levels of implementation, from field staff to local and national operatives. Without understanding the competencies required across each level of implementation, from rangers to managers, it is understandable that these competencies may be lacking.

A way forward

Excluding the more challenging impediments to effective SMART implementation, such as general governance in a country or PCA, the survey helps highlight where improvements could be made. The poorer performance of management relative to other aspects of the approach underlines the need to build capacity at different levels of the adaptive approach. The over-reliance on data officers or administrators may be drawing focus away from other equally important aspects of the approach. The SMART Partnership, a collaboration of nine conservation organisations (SMART, 2021), has acknowledged this issue and has developed detailed competencies for roles at various levels of the SMART approach (Stanciu et al., 2021). Though each site will differ, SMART competencies aim to define and distil the skills and knowledge required to implement SMART across four broadly defined personnel levels (Stanciu et al., 2021). This will aid in understanding, as well as directing future training to PCA staff at all levels.

Other challenges, such as lack of consistent training of frontline staff and a lack of clear or written protocols, should also be addressed through management plans and increased communication efforts made to all staff involved. The long-term cost of equipment, training and infrastructure for SMART implementation needs to be carefully considered and factored into the management processes of sites along with other aspects of PCA management. In fact, whether SMART implementation is appropriate or sustainable for any particular PCA should also be considered prior to adoption of the tool, as with any novel technological intervention (Cronin et al., 2021).

This study suggests that the continuing evolution of SMART, both as a software tool and approach, will improve conservation results. Consistent feedback from implementing sites as well as the production of easy-to-use guidance documents and training, focused at all levels of implementation, will likely improve SMART implementation results in many sites with sufficient enabling conditions. Regular review and reflection at implementing sites as well as alignment with other widely used monitoring tools that rely on quantitative evidence, such as METT, will also likely increase the utility of SMART. In those sites without sufficient enabling conditions or commitment by implementing agencies, we cannot expect SMART, nor any other tool, to yield positive conservation outcomes. Continued

assessment of what is required on a site-by-site basis, and whether the investment in tools such as SMART is worthwhile, will continue to be needed.

CONCLUSION

The survey was designed to provide a simple snapshot overview of SMART implementation. The survey suggests that the quality of SMART implementation increases over time, with management adapting to the use of the tool. However, some of the higher scoring sites with more recent deployments suggest that higher quality implementation is not solely a result of longer implementation periods. A much more in-depth and detailed study would be needed to explore these results and outline additional factors leading to success. The performance of sites in the assessment generally reflect the perceptions of SMART experts through direct observation, yielding results that could be interesting and useful to other implementing agencies. With a sufficient understanding of the gaps in effective SMART implementation, it becomes possible to address these gaps, aiming for stronger implementation, stronger PCA management and ultimately stronger conservation efforts.

ACKNOWLEDGEMENTS

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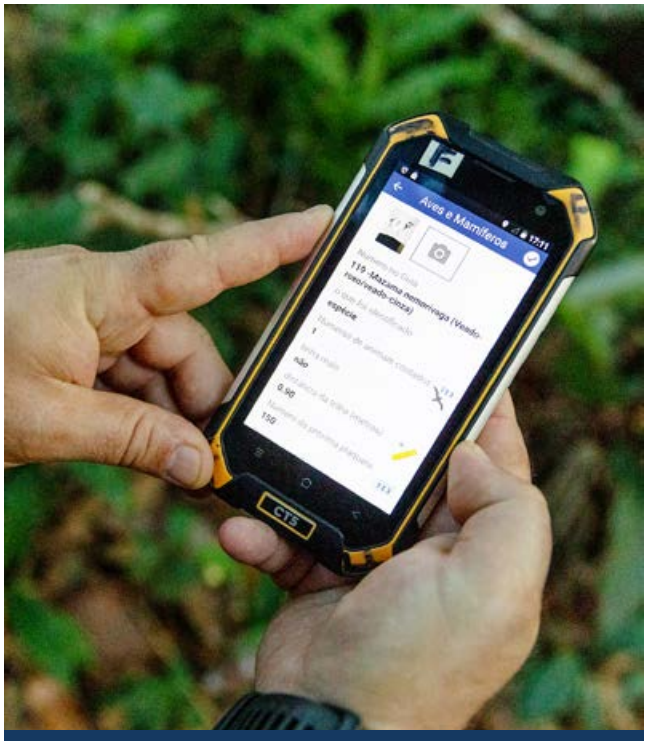

SMART Mobile application for field data collection © Myke Sena / WWF-Brazil

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RESUMEN

La gestión eficaz de las áreas protegidas y conservadas es crucial para preservar gran parte de la biodiversidad mundial. La Herramienta de Seguimiento e Información Espacial (SMART) es una de las herramientas de gestión de áreas protegidas y conservadas más utilizadas en todo el mundo, y se emplea para informar sobre la investigación, la gestión del turismo, el uso de los recursos naturales, la inteligencia, el análisis de amenazas y mucho más. Mediante encuestas al personal de 49 áreas protegidas y conservadas de 14 países, examinamos cómo se está aplicando SMART en lo que respecta a ocho factores clave en la gestión de datos y la toma de decisiones. Los resultados indican que hay margen de mejora en todos los aspectos del proceso adaptativo, sobre todo en lo relativo a la planificación de patrullas sistemáticas, así como al papel de la administración en el proceso adaptativo. Además, muchos centros ofrecen escasa formación y carecen de personal suficiente. Esta información ayudará a desarrollar orientaciones sobre lo que necesitan las áreas protegidas y conservadas para la aplicación eficaz de SMART.

RESUME

La gestion efficace des zones protégées et conservées est essentielle à la préservation d'une grande partie de la biodiversité mondiale. L'outil de suivi et de rapport spatial (SMART) est l'un des outils de gestion des zones protégées et conservées les plus utilisés au monde. Il sert à informer la recherche, la gestion du tourisme, l'utilisation des ressources naturelles, le renseignement, l'analyse des menaces et bien d'autres choses encore. En interrogeant le personnel de 49 aires protégées et conservées dans 14 pays, nous examinons comment SMART est mis en œuvre en fonction de huit facteurs clés de la gestion des données et de la prise de décision. Les résultats indiquent qu'il est possible d'améliorer tous les aspects du processus d'adaptation, en particulier en ce qui concerne la planification des patrouilles systématiques et le rôle de la direction dans le processus d'adaptation. En outre, de nombreux sites offrent un faible niveau de formation et souffrent d'un manque de personnel. Ces informations permettront d'élaborer des orientations sur les besoins des zones protégées et conservées pour une mise en œuvre efficace de SMART.

BOOK REVIEW

Huntley, B.J. (2023) Strategic Opportunism: What Works in Africa: Twelve Fundamentals for Conservation Success

SpringerBriefs in Environmental Science
https://link.springer.com/book/10.1007/978-3-031-24880-1:
Reviewed by Eugene Moll

Brian Huntley is a graduate of the University of Natal (now UKZN), Pietermaritzburg where, while still a student, he was mentored by Ian Garland and his first publication was a study of the Ngoye Forest (now Ongoye). His first job was a study of the vegetation of Marion and Prince Edward Islands. Later he worked in conservation in South Africa and Angola, then for the CSIRO (where he and others developed and administered the extremely successful Cooperative Scientific Programmes focusing on Biome research), and later as Director of what was to become the South African National Biodiversity Institute and at the same time as Professor in the Department of Botany at the University of Cape Town. In retirement he works internationally as a consultant.

Huntley, in a note to the editor of *PARKS*, Marc Hockings, when discussing this book remarked: "*The world is certainly becoming less settled than we have known since WW2, with a steady descent into chaos in even developed nations (like the UK, USA and France, with absolute catastrophe in some – Syria, Ukraine, Afghanistan, Congo). South African politicians are doing their best to turn Mandela's dream into a nightmare mafia state. So, one must console oneself on a few notable victories for conservation such as Gorongosa and other models described in* **Strategic Opportunism**."

At this time in our history, when many are beset by 'environmental melancholia' (a condition resulting from environmentally induced stress and depression), it is good to learn that, in Africa, there are major conservation successes in many countries where regional collaboration and citizen science are demonstrating conservation victories, but how permanent these will be remains to be seen!

Huntley, in his book, focuses on achievements over five decades in diverse countries and circumstances which, despite enormous challenges, have resulted in sustained success at different spatial scales, socio-political circumstances and institutional capacities. His chosen case studies are not those that have already been widely publicised and well-funded (namely those by the Peace

Parks Foundation, African Parks Foundation and South Africa's own Working for Water project), but rather he has highlighted less familiar and more modestly funded projects. Each one demonstrates pragmatic solutions to complex problems. In each case the success of the chosen project required remarkable leadership and fortuitous timing – hence the title "*Strategic Opportunism*". In this review, I have highlighted some of the examples Huntley has recorded:

THE SAVING OF THE GIANT SABLE (ANGOLA)

The success of this project relied on multiple factors from international concern, the development of a wide base of local volunteers and donor support, as well as the involvement and commitment of the local population. But the main driver for success was one Pedro Vaz Pinto whose passion and tenacity as a volunteer over ~30 years has saved the Giant Sable from extinction. It all started with the discovery of a small herd of Giant Sable that were threatened, and ended with their eventual translocation to a safe place where the herd has flourished.

The Giant Sable Project demonstrates the concept of strategic opportunism. In its simplicity, focus and the adaptability of its leader.

MARION ISLAND: BIRDS, CATS, MICE AND MEN

This second example details how cats, introduced in 1948 to deal with the mice situation (mice were accidentally introduced in 1818) then went feral, causing massive problems with the nesting birds by 1952. Ultimately what followed was the most ambitious, longest, largest and most expensive cat eradication programme yet. With the last cat being trapped in July 1991.

While the cat population was being slowly eradicated, the mouse population was again growing alarmingly. By 1995, thanks to the long-term efforts of John Cooper, one of the pioneer researchers on Marion, a mouse eradication campaign was planned. To accelerate action, BirdLife South Africa partnered with the South African National Antarctic Programme, to implement a programme that will hopefully soon achieve the required results as it is based on the successful approach employed on 62 other islands, including sub-Antarctic Macquarie.

GORONGOSA NATIONAL PARK: WILDERNESS, WAR AND WILDLIFE RECOVERY

Once an African Eden in the 1960s, the park was decimated during the War for Independence, such that by the 1990s only some 15 per cent of the wildlife remained.

Thanks to a fortuitous visit in 2004 by Gregory Carr, an American entrepreneur, human-rights activist and philanthropist, an innovative and efficient 20-year development partnership was entered into between the government of Mozambique and the Gregory C. Carr Foundation. So successful is this Gorongosa Restoration Project (now the GP) that the agreement has been extended for another 25 years.

What this approach demonstrates is that there are no quick fixes, but rather long-term, financially stable commitments are required to achieve conservation goals.

Today the project's strategy spells out its ambitious vision: "*A thriving, biodiversity-rich, Greater Gorongosa conservation landscape, which supports Sofala Province as an engine for resilient and sustainable development enabling nature experiences and wellbeing for its people, enriching all of Mozambique and the world.*"

By 2019, the park and its adjoining conservation areas were expanded as land-use agreements and transfers were negotiated in incremental steps towards the grand design of a park extending from Mount Gorongosa, across the Rift Valley and the Cheringoma Plateau to the Zambezi River floodplains of Marromeu and the sea – from the mountain to the mangroves – as was originally proposed by Tinley (1977, 2021) in his benchmark ecological study.

Since 2005, the GP has mobilised the investment of more than US$120 million in partnership with multiple donors. GP staff have increased from less than 100 to over 1,000, 98 per cent of whom are Mozambican (with most of them coming from the surrounding Buffer Zone). Health, education and agricultural development activities touch the lives of 200,000 people in the Buffer Zone where four schools have been built. The GP also provides bursaries for 37 girls to attend high school and runs Nature Clubs in 50 primary schools involving over 2,000 girls. The GP supports 88 community health workers, 129 traditional birth attendants and 159 'model moms' in the districts adjoining the park. Increased emphasis is now being given to community-based natural resource management, drawing on the experience of the Namibian Association of Community Based Natural Resource Management.

As today's visitors to Gorongosa can attest, actions speak louder than words. Huntley observes that what has been achieved since his 2014 visit would astonish any experienced observer of conservation action in Africa. Gorongosa is providing a powerful stimulus for the local economy, in an area plagued by poverty, poor infrastructure, malaria and low agricultural productivity.

The GP, as a model of government/private sector collaboration, demonstrates what can be achieved in a relatively short time in Africa. The Mozambique government had the foresight to understand the advantages of partnering in good faith with a private philanthropist. Mutual trust and a common vision built a network of local communities and foreign expertise to rapidly rehabilitate a fractured ecosystem. With an annual budget of US$16 million, of which 56 per cent comes from foundations, philanthropy and donations, and 44 per cent from cooperation partners, the GP still has a way to go before becoming financially self-sustaining. However, financial independence is a dream that no large, protected area in Africa has yet attained. What is more important is that the financial model adopted by the GP is vibrant, innovative and adaptive. Its performance over the decade since the far-sighted partnership agreement was signed between the government of Mozambique and the Gregory C. Carr Foundation is a model for any African protected area to follow.

OVERCOMING THE TAXONOMIC IMPEDIMENT: SABONET AND THE AFRICAN PLANTS INITIATIVE

Because post-colonial Africa suffered from the paradox of a steady erosion of national collections (of plant and zoological specimens) simultaneously with the rise in international and national concern for biodiversity conservation, an African approach to the paradox was needed, and ambitious action plans were developed and approved. Thus, between 1990 and 2016, after many meetings of biologists from a dozen southern African countries, and sustained funding applications, finally the Global Environment Fund (GEF) provided sufficient funds to establish a network of exchange and training opportunities for southern African plant cientists, specifically to promote information gathering, collaborative studies and to publish regional studies.

In addition, a strategic plan to mobilise a training and capacity development network was developed. The project was called the Southern African Botanical Diversity Network (SABONET). Much of the success of the initiative rested on the shoulders of Christopher Willis (project coordinator). GEF funding of US$4.7 million, matched by similar funding from the ten participating countries, enabled the implementation of the SABONET model: 'Learning by doing'.

The major works coming out of the SABONET include ~20 000 new herbarium collections, published checklists of member countries, and plant red data lists. Most importantly there is now a computerised data inventory of over 450,000 herbarium specimens. SABONET has supported dozens of graduates and the training of over 150 herbarium and botanical gardens technical staff. Many participants now hold senior positions in their national government and academic institutions. In an extensive review of the history of plant taxonomy in South Africa, Victor et al. (2016) identify SABONET as: "*One of the most influential biodiversity capacity building initiatives globally*."

Other initiatives Huntley details are:

The development of a conservation science ethos – on the back of the extremely successful South Africa Cooperative Scientific Programmes, leading to involvement and the critical role of citizen scientists – and the importance of iNaturalist globally.

Bridging the gap: Community conservancies in Namibia and Zimbabwe – how to ensure sustainable benefits to rural communities while conserving the natural resources of remote arid ecosystems in southern Africa. Huntley identifies Community Based Natural Resource Management (CBNRM), which in the west of southern Africa, in the Koakoveld of Namibia, was driven by Garth Owen-Smith from a socio-ecological perspective – a romantic vision of an arid Eden occupied by Herero and Himba pastoralists living in peace with elephants, rhinos, oryx, springbok, cattle and goats, sharing dramatic desert landscapes. And in the east, in the Zambezi valley of Zimbabwe, Rowan Martin, Russell Taylor and Brian Child, using economic and ecological principles, sought the transformation of the degraded rural rangelands surrounding national parks into profitable enterprises based on a sustainable-use model financed primarily through trophy hunting.

NOTE: The current debate on the future of trophy hunting may well change the landscape outlined above. Without income from hunting many of the CBNRM initiatives may well fail. Only time will tell.

The final section in Huntley's book enumerates his '**Twelve fundamentals for conservation success'**. Briefly these are:

1. **Identify an urgent and existential crisis** – conservation science has been called a 'crisis discipline'. This is a mix of science and art where one must act before all the facts are known. It thus requires intuition as well as information. Tolerating uncertainty is often necessary.
2. **Present an inspiring vision, clear goals and realistic strategies** – a clearly defined vision provides the necessary inspiration and focus for success in any challenging project. The goals of some

projects were narrow – 'Save the Giant Sable' or 'Eradicate feral cats', 'Rehabilitate Gorongosa'. Others were broad – 'Remove the taxonomic impediment', or 'Empower rural communities to take ownership of their wildlife resources'. In each case the vision and goals were backed by a convincing strategy of communicating with, and securing the commitment of, over many years, a wide diversity of stakeholders.

3. **Develop networks of synergistic collaboration** – these are important longer-term responses. The early NGO networks that started in the early 1900s laid the foundation for later international non-governmental organisations. Key among these were the Species Survival Commission (SSC) and the World Commission on Protected Areas (WCPA) of the IUCN (International Union for Conservation of Nature) the International Union of Biological Sciences (IUBS) and the Scientific Committee on Problems of the Environment (SCOPE). A simple process of 'thinking globally, acting locally' was followed. While the focus must be on synergistic partnerships and networking with like-minded individuals and organisations, positive engagement with parties having opposing views or agendas is essential. Conservation by its very nature must confront those who recklessly exploit natural resources. Positive engagement with perceived enemies is the first step to problem resolution. It is a fundamental component of strategic opportunism.
4. **Communicate effectively with all stakeholders** – obviously any conservation project should capture the hearts and minds of all its stakeholders.
5. **Synthesise existing or create new biodiversity knowledge and understanding** – whether driven by an individual or by consortia of large scientific institutions the projects must be science-driven.
6. **Secure institutional support and develop project implementation capacity** – a key challenge in many African states is the weakness of national institutions, most especially those responsible for science. But conservation projects are not driven by researchers alone. They need many skills, most especially in the multiple tasks involved in project design, administration, convening meetings, preparing budgets, audits and reports to governments and donors. This is often where even the most elegant project plans can fail. Where local capacity has been lacking, national and especially international NGOs have stepped in.
7. **Promote champions and nurture strategic leadership talents** – well illustrated in most of his chosen projects.
8. **Create and capitalise on quick wins: success breeds success** – ambitious conservation projects can take years, even decades to achieve their goals. Thus, it is important to focus on early success to demonstrate that the journey is producing meaningful results.
9. **Recognise the critical importance of good governance** – the existence of supportive legislation, policies, clear lines of authority, and effective management and monitoring systems are critical if projects are to succeed.
10. **Embrace the unexpected opportunities of serendipity, good luck and good timing** – the serendipitous congruence of chance, timing and responsive minds is a key component of strategic opportunism and must be embraced and channelled.
11. **Seize the political moment of changes in governance** – political will is a prime driver of conservation success. Political change in southern Africa led to radical and positive reforms of colonial policy and law. These were of critical importance to future trajectories of conservation actions.
12. **Develop creative financing strategies** – two contrasting conservation funding models have emerged in the past few decades. At one extreme, the GEF and aid agencies such as USAID, GTZ, DFID, etc., have made available billions of dollars for biodiversity projects around the globe. At the opposite extreme, the rapid growth of citizen science activities, facilitated by the internet and social media, and operating on slender budgets, have proven the value of volunteer networks. They can have low costs and high impacts.

Finally, the fundamental changes that have emerged in conservation thinking and wildlife management approaches in Africa over recent decades need to be embraced. The recognition that ecosystems are seldom in equilibrium, are heterogeneous, and are constantly responding to external fluxes, suggests that the '*balance of nature*' concept is a myth. Adaptive management that requires pragmatism, flexibility and an experimental, learning by doing philosophy are key to strategic conservation success.

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