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Enhancing climate change mitigation in protected areas: A practical guide for practitioners and decision-makers

Aim: To present a short, practical guide to integrate climate change mitigation (CCM) into Protected and Conserved Area (PCA) management and decision-making and as a companion to the WCPA technical report *Enhancing climate change mitigation in protected areas*[1].

Audience: PCA managers and decision-makers who are interested in how CCM relates to PCA management, how PCA management can support CCM, how to incorporate CCM into existing management plans for PCAs and how to develop policies on the creation and management of PCAs for CCM.

Summary

- ✓ Climate change mitigation (CCM) can be incorporated into new or existing management plans for protected and conserved areas (PCA) by making it an explicit objective of PCA management. It can be considered in all stages of the planning process, including ensuring that the sequestration and long-term storage of carbon dioxide (CO_2) is monitored and reported on.
- ✓ Including CCM in PCA management has several advantages, such as access to climate finance mechanisms and identifying synergies between biodiversity and climate change.
- ✓ It can be costly to account for CCM in a PCA management plan, so budgets have to be adjusted.
- ✓ Some ecosystems within PCAs are more likely to be important for CCM than others. These include forests, grasslands, savannas, peatlands, mangroves, salt marshes and seagrass beds.
- ✓ Experiences shared by those who have already embarked on this journey provide valuable lessons. Lessons from the 27 case studies presented in the full report *Enhancing climate change mitigation in protected areas*[1] are summarized here.

Mangrove forest in Cambodia, important for its biodiversity values and carbon reservoirs.
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1. Introduction

Protected and conserved areas (PCAs) are not only impacted by climate change they are also part of the solution. Most guidance on climate change and PCAs addresses the risks of climate change to PCAs and the importance of adapting management in order to protect the biodiversity for which most PCAs have been created. This technical note is designed to help managers recognize how management of PCAs can reduce greenhouse gas (GHG) emissions by protecting the ability of an ecosystem to sequester carbon and store it over the long-term. It provides a practical supplement to the WCPA technical report *Enhancing Climate Change Mitigation in Protected Areas*[1].

1.1 Principles

- Directly reducing GHG emissions is the most effective way of addressing climate change. Accounting for the avoided emissions from protecting carbon-dense ecosystems is a Natural Climate Solution which can supplement emissions reductions, but it can never be the only or primary effort to reduce GHG emissions.
- Climate change mitigation measures should not conflict with a PCA's biodiversity conservation or cultural objectives. They should be designed in a way that ensures that biodiversity either benefits or is not adversely affected (e.g., strengthening the conservation and management of ecosystems, using native species for restoration, etc.).
- When considering Natural Climate Solutions, protection of healthy ecosystems provides the greatest climate change mitigation benefits, followed by restoration of damaged ecosystems.
- Implementing CCM measures should respect the rights and title of Indigenous peoples, including the principle of Free, Prior and Informed Consent (FPIC).

1.2 Scope

- This technical note is intended to provide an approach for understanding/incorporating climate change mitigation into an existing PCA management regime and to support decision-making related to the creation of new PCAs.
- An adaptive management approach is recommended, although this technical note will also be useful for those PCA managers who develop and follow management plans without a formal process to close the adaptive management cycle.
- This technical note assumes that the reader understands the concept of taking a basic adaptive management approach to PCA management and the different models for adaptive management. For more information about adaptive management, see resources in section 5.
- Many PCAs are inadvertently mitigating climate change. One of the purposes of this technical note is to highlight how that is happening; another is to demonstrate how this function can be enhanced.
- Not all places important for biodiversity are important for climate change mitigation and vice versa. Chapters 3 and 6 of *Enhancing Climate Change Mitigation in Protected Areas*[1] are helpful in identifying the ecosystems with the most potential for enhancing both climate change mitigation and biodiversity simultaneously.
- Measuring climate change mitigation requires significant effort and specialized technical skills. It is likely that PCA managers will only want to make this effort if they can derive some benefits from it, for example by accessing funds earmarked for GHG reductions, including the global carbon market, or supporting government commitments to global targets. This guidance includes some basic information about accessing climate change funding for PCAs. More detailed advice on PCA financing can be found in Chapter 8, and details of national, regional and global policies and commitments in Chapter 2 of *Enhancing Climate Change Mitigation in Protected Areas*[1].

1.3 Out of scope

Measuring biodiversity

Most PCAs are managed for multiple values, with biodiversity conservation as a primary value. This technical note does not provide details on how to measure and manage biodiversity, as this is covered elsewhere. Rather, it focusses specifically on how to incorporate climate change mitigation into PCA management and policy.

Threat analysis

Threat analyses are usually conducted as part of PCA management plans. Significant guidance already exists on how to conduct a threats analysis from the perspective of biodiversity conservation. This can involve detailed threats classifications, such as rating the effect of each threat on each priority ecosystem and species[2,3]. The threats to climate change mitigation inside and surrounding a PCA are often the same as the threats to biodiversity.

Climate change adaptation

PCA managers generally understand that all ecosystems are impacted by climate change and that management actions need to be adjusted to accommodate the impacts of climate change on a PCA. Guidance on incorporating climate change adaptation into PCA management has been covered extensively elsewhere, including in WCPA publications *Adapting to climate change: Guidance for protected area managers and planners*[4] and *Establishing marine protected areas in a changing* climate[5]. Other publications include *Climate-smart conservation practice*[2], *Building capacity for climate adaptation planning in protected area management: Options and challenges for World Heritage*[6] and *Towards future-oriented conservation: Managing protected areas in an era of climate change*[7].

Carbon-dense, high-biodiversity tropical rainforest Malaysia/Kalimantan border. © Ramdan Nain / iStock.com

2. Climate change mitigation in PCAs in an adaptive management framework

Protected areas can preserve carbon stores for long periods and safeguard the elements of an ecosystem that sequester carbon dioxide from the atmosphere. Natural or anthropogenic disturbances in PCAs can make them vulnerable to switching from a sink for GHG emissions to a source. Purposeful management for mitigation can allay the effects of these disturbances and increase climate change mitigation benefits.

Explicitly or implicitly, many PCA managers use an adaptive management approach in their efforts to conserve biodiversity. That is, they assess the context of their PCA, make a plan of action, implement that plan, analyse what is working and what needs changing, and adapt accordingly. We have structured this document around a generic conservation adaptive management cycle (Figure 1). For each step (assess the context, plan, implement, analyse and adapt, share results), we briefly present the typical actions that a manager would take to conserve biodiversity, and then we explain what one would do in addition, for each step, to integrate climate change mitigation. The adaptive management approach is usually portrayed as a circle with connecting arrows, depicting the intention to continually improve on management.

PCA managers who develop and implement PCA management plans, but do not specifically follow an adaptive management cycle, can also follow the steps outlined in this technical note.

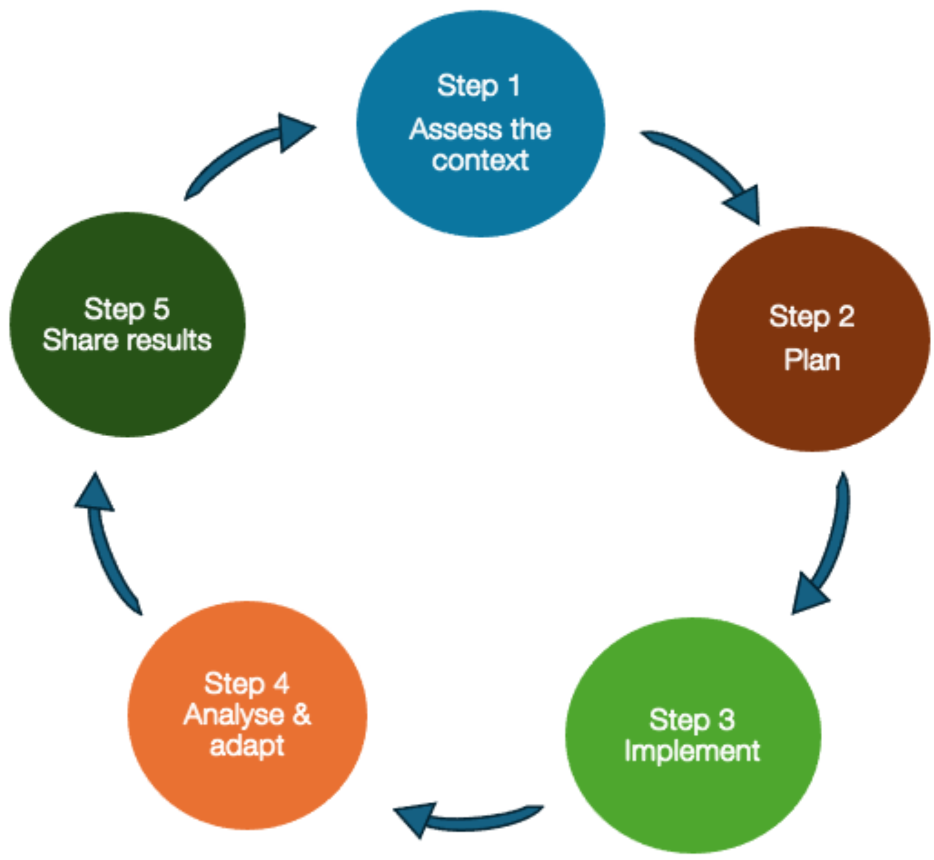

Figure 1. Generic adaptive management cycle. Several versions of the adaptive management cycle have been used by protected areas practitioners. The version presented here is adapted from the *Open standards for the practice of conservation*[3].

Step 1– Assess the context

What does step 1 typically include for biodiversity conservation?

Step 1 in the adaptive management cycle typically involves assembling available knowledge and resources for informed, flexible management. It includes identifying the geographic context, relevant supporting policies, vision, ecosystems and species on which conservation efforts will focus, the most important threats to those ecosystems and species, the principal drivers of change and opportunities, the team that will develop the management plan and the key constituencies interested in or impacted by the project. In this step the technical team, Indigenous rights and title holders, community members, interested and affected parties are all engaged to ensure they have input right from the beginning. Data sovereignty, particularly as it relates to Indigenous peoples, is also addressed in this step.

What additional work is needed to incorporate climate change mitigation?

Adding climate change mitigation to an existing PCA management framework involves:

- Modifying the vision and objectives to include CCM;
- Identifying the ecosystems in the PCA that are likely to be important for CCM. Ecosystems known to have particular importance for biodiversity and CCM are forests, grasslands and savannas and peatlands in the terrestrial realm and mangroves, salt marshes and seagrass beds in the coastal marine realm. (For details see Chapter 3 in *Enhancing climate change mitigation in protected areas*[1]);
- Assess the CCM potential of the particular PCA to determine if it is a good candidate for the creation of a climate stabilisation area. These areas have been proposed as places managed to maximise carbon sequestration by natural ecosystems[8].

- Determining regional, national or sub-national climate change commitments or targets that could apply to the PCA, such as Nationally Determined Contributions (NDCs) to the Paris Agreement or biodiversity targets related to the Kunming-Montreal Global Biodiversity Framework (GBF). Countries that have identified the use of PCAs to meet their GHG emission reductions targets may have resources to support tracking and enhancing CCM in PCAs;
- Identifying available scientific knowledge products and underlying data specific to CCM, such as carbon-density maps and maps that overlay carbon-density and biodiversity;
- Identifying existing, relevant knowledge products from Indigenous communities and from local communities;
- Identifying specific threats to the PCA that make it vulnerable to becoming a source of GHG emissions;
- Identifying funding that might be available for CCM in PCAs such as carbon markets and non-market instruments for climate change financing. (See chapter 8 in *Enhancing climate change mitigation in protected areas*[1]). Step 2, below, includes planning to obtain funding;
- Identifying the team who can provide technical information specific to climate change mitigation, Indigenous and traditional knowledge-holders, the partners that should be consulted, and the community members and stakeholders who might be affected, including supplementing the team with experts on assessing carbon sequestration and reservoirs.

Step 2 – Plan

What does step 2 typically include for biodiversity conservation?

Step 2 of the management cycle typically involves the development of an overall plan. Key components include: developing specific goals for focal ecosystems and species; identifying specific actions that will contribute to achieving goals; choosing indicators and articulating an associated monitoring and evaluation plan to measure progress, lessons learned and areas needing adjustments; and identifying funding and capacity needs.

What additional work is needed to incorporate climate change mitigation?

Most of the planning for biodiversity conservation in a PCA also benefits CCM. A few additional elements are needed to specifically address CCM:

- Adding goals specific to CCM that describe the extent to which GHG emissions will be avoided through protection of ecosystem elements that sequester carbon;
- Supplementing information needs to include quantifying carbon sequestration and storage. This addition can be resource intensive, although methodologies are well developed for both terrestrial and coastal marine ecosystems. (See chapter 4 in *Enhancing climate change mitigation in protected areas*[1]);
- Identifying opportunities to supplement funding with climate financing mechanisms. This is often the primary motivation for adding CCM to PCA management. Table 1 below provides a brief summary of climate financing mechanisms. (See chapter 8 in '*Enhancing climate change mitigation in protected areas*[1] for a deeper overview of climate financing for PCAs, including a discussion of the benefits and risks.)

Peatlands contain carbon below-ground that has often taken thousands of years to accumulate and is considered irrecoverable if lost. This Arctic peatland is in Canada. ©Pi-Lens / Shutterstock.com

Peatland forests of the Congo Basin are believed to be the most carbon dense tropical peatlands in the world. The picture above is from Odzala-Kokoua National Park, Republic of Congo. ©Roger del la Harpe / iStock

Table 1. Summary of opportunities to access climate change funding for PCAs

Opportunities	Considerations and criteria
A wide range of climate change funding programs may be available	• Market-based programs include carbon offset markets, international and domestic compliance mechanisms, resource user fees, payments for ecosystem services and incentive-based programs. • Non-market-based programs include direct funding from governments to meet climate change targets (i.e. funds to achieve Nationally Determined Contributions (NDCs) to the Paris Agreement), non-governmental organisations, and international donor agencies.
Market-based programs	
Carbon credit and offset projects	• Carbon credits for PCAs can be sold on the open market, sometimes in voluntary markets and sometimes through domestic compliance mechanisms. Approximately 15% of nature-based carbon offset projects overlap with PCAs. • Five basic criteria are important to sell carbon offsets: - additionality – proof that the GHG emissions reduction would not have happened without the carbon offset; - permanence – the carbon offset programme will result in long-term GHG emission reductions; - leakage – the carbon offset programme will not lead to increased GHG emissions somewhere else; - quantification – the GHG emissions benefits can be credibly quantified; - verification – an independent third party monitors the results of a carbon offset program and verifies that all criteria have been met.
Compliance mechanisms	• International compliance mechanisms include programs such as REDD+ and Clean Development Mechanism. These are implemented at the national and sub-national level in developing countries and are available for PCAs. • Domestic compliance mechanisms can include carbon crediting and offset markets, many of which are focused on natural ecosystem protection and/or management. However, the bulk of these include forest-based carbon offset projects; few include other ecosystems important for climate change mitigation such as grasslands, coastal blue carbon, peatlands.
Payment for ecosystem services (PES)[9]	• In PES landowners are paid, usually by governments, to manage their land for ecosystem services, such as climate regulation. With over 500 PES programs worldwide and combined annual payments of USD 36 billion, PES provide opportunities for PCAs on private land.
Results-based climate finance (RBCF)[10]	• Funding is paid when results – reductions in GHG emissions – have been verified. Creation of PCAs, as a Natural Climate Solution, is well suited for RBCF.
Allocation of carbon taxes to PCAs[11]	• Some jurisdictions allocate a percentage of carbon taxes on fuels to PCAs (e.g. Colombia).
Non-market-based programmes	
Project Finance for Permanence (PFP)[12,13]	• PFP involves investments by philanthropic foundations, governments and often Indigenous peoples to establish PCAs that are believed to be secure because they are managed by a board of directors who are not subject to changing priorities of governments. The PFP model is being embraced in many developing and developed countries (e.g. Palau, Fiji, Chile, Amazon Basin, Mongolia, Canada). In general, this model has allowed for PCA creation including various forms of Indigenous protection across large landscapes.

Pursuing climate change funding mechanisms to support PCA management and creation has both benefits and risks that need to be considered.

The benefits include:

- Diversifying funding for PCA management. Available funding using climate change mechanisms is often greater than the funding available for biodiversity conservation;
- Enhancing synergies between climate change mitigation and biodiversity conservation;
- Providing a source of income for local communities to enable conservation-based economies and to offset lost income from PCAs.

The risks include:

- Infringing on the rights and title of Indigenous peoples if their free, prior and informed consent (FPIC) is not obtained;
- Greenwashing. This refers to false claims about the degree to which a PCA reduces GHG emissions. Examples include: investments in PCAs as a substitute for direct reductions in GHG emissions; overestimating the carbon benefits of a project; not meeting the five basic criteria for credible carbon offsets (see Table 1). PCAs can supplement GHG emission reductions, but they cannot replace the urgent need to directly reduce GHG emissions;
- Overemphasis on carbon without consideration for biodiversity can result in unintended negative impacts on biodiversity and other values. For example, planting monocultures of fast-growing, non-native trees can result in reductions in GHG emissions, but have a negative impact on biodiversity and ecosystem resilience;
- Dependence on carbon markets that can be volatile;
- Dependence on mechanisms that inhibit scaling up PCAs to the landscape or trans-national level when funding is national or sub-national.

Step 3 – Implement

What does step 3 typically include for biodiversity conservation?

Step 3 involves putting into action the plan developed in step 2. This includes collecting baseline information, ongoing monitoring and ensuring that financial and human resources are adequate. All of this work should be done within the context of national protected area policies and procedures and adhere to decision-making processes for approving work plans and budgets.

What additional work is needed to incorporate climate change mitigation?

The additional work is implementing the components of the plan in step 2 that are specific to CCM. This often also involves expanding the sources of available funding to include climate change funding mechanisms and expanding the team to include climate change assessment experts. Chapter 4 in *Enhancing climate change mitigation in protected areas*[1] provides details on the methodology for assessing CCM. It is generally necessary to measure the CO_2 sequestered on an annual basis and the CO_2 stored over the long-term. This can be done through direct field measurements, the use of proxy measurements from global or preferably nearby and similar ecosystems, the use of various satellite imagery and GIS products (some of which are free), and well-established models. Several publicly available process-based models allow the user to convert biomass measurements to CO_2, although all of these models have strengths and weaknesses. Finally, although similarities exist between terrestrial and coastal blue carbon, there are also differences to consider.

Coastal blue carbon ecosystems, such as seagrass beds, salt marshes and mangroves have a greater density of carbon than terrestrial forests, although the global area they cover is limited. Managing for CCM is increasingly important in these ecosystems, many of which are classified as Marine Protected Areas (MPAs).

Seagrass bed Spain. © Damocean / iStock.com

Po Delta salt marsh, Italy © ermess / iStock.com

Mangrove forest in Australia. © StephenBridger / istock.com

Step 4 – Analyse and Adapt

What does step 4 typically include for biodiversity conservation?

Step 4 involves managing data, regularly analysing it to generate useful information and using this information to make decisions that increase the effectiveness of PCA management. Ongoing analysis of data, as it is generated, can confirm expected results or identify challenges to key assumptions developed in the planning phase. This step provides the evidence base for adaptive management, as it should result in revisiting assumptions and adjusting goals and objectives. Data collection includes feedback from partners, stakeholders and interested parties. The monitoring system set up in step 2 (plan) should provide the information needed for these analyses.

What additional work is needed to incorporate climate change mitigation?

In general, adding CC mitigation to PCA management does not fundamentally change what is done in step 4. Specific differences include:

- The data being managed will be different – carbon storage and sequestration as compared to biodiversity data.
- As the monitoring plan for CCM involves different indicators and measurements, the data analysis will draw on methodologies from climate change rather than biodiversity and likely require different expertise than biodiversity measurements.
- Data collected for CCM in a PCA should be compared to the data for similar ecosystems globally to identify whether a PCA is particularly strong for CCM. This type of comparison is relevant information to support access to climate change financing. It also provides data important for improving global models.

Step 5 – Share results

What does Step 5 typically include for biodiversity conservation?

Step 5 involves sharing the lessons generated during Step 4 (Analyse & adapt) with key internal and external audiences, either informally or through formal products. This step also includes giving and receiving feedback and promoting a learning culture within the PCA team. Documenting results, approaches, successes and failures enables the PCA team and partners to reflect and generate lessons and insights, which will contribute to increasing the effectiveness of current PCA management and also strengthen future programming.

What additional work is needed to incorporate climate change mitigation?

There are no major differences in this last step if CCM is added as a value in a particular PCA. However, the audiences with whom mitigation lessons are shared will be wider and include not only the conservation, but also the CCM community.

3. Lessons learned from case studies

Twenty-seven case studies from around the world were collected for this work. Each case study assessed the climate change mitigation value of a particular PCA or ecosystem. Although the majority of case studies were conducted in forests, in some cases mangroves, salt marshes, seagrass meadows, savannas and peatlands were also assessed.

Figure 2. Map showing the geographic location of case studies collected for the technical report *Enhancing climate change mitigation in protected areas*[1]. Stars in green represent terrestrial case studies, those in blue are coastal marine. The numbers represent each case study in the order that it appears in the main technical report. Links to each case study can be found in the Appendix: Case study compendium. The countries where case studies are located: 1–Tanzania; 2–Europe; 3–Coastal China; 4–Brazilian Amazon; 5–Eastern Canada; 6–Cameroon; 7–Rio de Janeiro, Brazil; 8–Eastern USA; 9–Terrestrial and coastal, Rep of Korea; 10–Coastal Indonesia; 11–Canada; 12–Romania; 13–U.K. Scotland; 14–Coastal Indonesia; 15–Côte d'Ivoire; 16–Coastal USA; 17–Argentina; 18–India; 19–Dem. Rep. Congo; 20–Kazakhstan; 21–Ontario Canada; 22–Finland; 23–Mexico; 24–Coastal Brazil; 25–Australia; 26–Cambodia; 27-Western Canada.

As a group, the case studies provided some common lessons for those wanting to embark on a similar project.

Adaptive management – Most case studies were at the stage of collecting baseline information. A few detected trends by comparing satellite imagery of biomass at two points in time. Several identified the importance of ongoing monitoring.

Data availability – Several case studies identified the difficulty in obtaining free satellite imagery, missing attributes from available data or a lack of regionally relevant data (e.g. PCAs in Tanzania; Dja Wildlife Reserve, Cameroon; blue carbon in MPAs in Indonesia; Parks Canada). Most case studies relied on allometric equations to convert biomass to CO_2. Although species or regional updates to these equations are available (see chapter 4, *Enhancing climate change mitigation in protected areas*[1]) out-of-date equations were generally used.

Meeting the criteria for CCM in PCAs – One of the hardest criteria to meet for a credible assessment of CCM in PCAs is that of 'additionality' – i.e. proving that the benefits from a PCA would not have happened without the actions taken. The approach most often taken to prove additionality was to use counterfactuals – i.e. to compare the carbon inside a PCA with that in a similar unprotected ecosystem, but outside a PCA. This approach was successfully used to compare carbon inside and outside tiger reserves in India, PCAs in the Amazon, Natura 2000 sites in Europe, and PCAs in Tanzania.

Funding – Several case studies had received carbon offset funds or funds from climate funding mechanisms to do their analysis (e.g. Whaelghinbran Conservation Forest and Great Bear Rainforest in Canada). Nevertheless, funding was identified by most case studies as insufficient. A particular problem was obtaining long-term funding to do the ongoing monitoring so important for adaptive management.

Policy – Several case study teams were motivated to collect data on GHG emissions reductions in order to include PCAs and restoration in their country's Nationally Determined Contribution to the Paris Agreement. (e.g. Parks Canada, Korea National Park Service; China).

4. Further reading

Open Standards for the Practice of Conservation (Conservation Standards) Version 5.0

Adapting to climate change: Guidance for protected area managers and planners. IUCN Good Practices Guidelines (Vol. 24)

IUCN - CMP Threats Classification Version 4.0

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