

THE CONTRIBUTION OF MARINE PROTECTED AREAS TO CLIMATE CHANGE ADAPTATION

STATE OF THE EVIDENCE AND POLICY RECOMMENDATIONS



OCEAN & CLIMATE
PLATFORM

Aleksandar Rankovic, Juliette Jacquemont, Joachim Claudet, Marine Lecerf, Loreley Picourt

With the completion, during UNFCCC COP26, of the last remaining procedural elements that were needed to fully operationalize the Paris Agreement, the attention of climate negotiations can now fully turn towards action. The primary focus of COP27 is thus implementation, but the COP takes place in a context of deep economic turmoil and looming global recession, while the increasing impacts of climate change are creating an ever-stronger sense of urgency. More than ever, there is a risk to overfocus on solutions for climate change mitigation and adaptation that can appear as potential “low-hanging fruits” while their true benefits have not yet been properly assessed.

In this regard, marine protected areas (MPAs) are increasingly being advocated as ocean-based climate solutions, but if and how much MPAs can effectively contribute to mitigation and adaptation has remained controversial so far. ➡

KEY MESSAGES

■ **MPAs can contribute to climate adaptation by benefiting ecosystems and people.** Effective MPAs increase biodiversity, reproductive output of marine organisms and coastal protection. They contribute to food security, assets, increases in environmental awareness, and can promote participation and alternative livelihoods.

■ **The level of protection matters for MPAs adaptation benefits.** For biodiversity, as well as food security and income, benefits accrue most clearly in fully protected areas, or in highly protected areas with the presence of a fully protected MPA. And the longer the MPA is protected, the larger the benefits. Similar results were found for carbon sequestration as well.

■ **Involving local communities in MPA designation and management is key.** Negative effects can arise from MPAs on some aspects of social adaptation, such as user-rights, conflict and costs. Involving local communities in the design, implementation and management of MPAs is necessary to ensure environmental justice and avoid potential negative social impacts.

■ **Opportunities exist throughout UNFCCC processes to better recognize the climate benefits that MPAs can provide, including decisions made in Sharm El-Sheikh.** MPAs could be included in the workshops of the Glasgow-Sharm El-Sheikh Work Programme on the Global Goal on Adaptation, in the works of the Nairobi Work Programme and the Adaptation Committee, and addressed during the Global Stocktake. At the national level, MPAs could be included in National Adaptation Plans (NAPs) and Nationally Determined Contributions (NDCs) and their associated climate finance support, with equitable access to resources, and including for MPAs as ecosystem-based approaches for the adaptation of coastal cities.

■ **In Sharm El-Sheikh, Parties should urge for an ambitious outcome of Biodiversity COP15.** COP27 takes place only a few weeks before COP15 (7-19 December, Montreal) of the Convention on Biological Diversity (CBD). COP27 should send a call for an ambitious outcome at CBD COP15. There will be no delivery on Paris without a strong deal in Montreal.

To address this knowledge gap, a systematic literature review of 22,403 publications¹, spanning 241 MPAs across the ocean, was conducted to assess the state of the evidence on the contribution of MPAs to both climate change mitigation and adaptation. After a first brief presented during COP26 that demonstrated how marine conservation can contribute to mitigation through its positive effect on several marine carbon pools², this brief focuses on the results for adaptation, which is a core topic of COP27.

1 ECOLOGICAL AND SOCIAL BENEFITS OF MPAS FOR ADAPTATION

The latest assessment of IPCC's Working Group II (2022) states, with high confidence, that "maintaining the resilience of biodiversity and ecosystem services at a global scale depends on effective and equitable conservation of approximately 30% to 50% of Earth's land, freshwater and ocean areas, including currently near natural ecosystems"³. A better mechanistic understanding is however needed on how MPAs contribute to climate change adaptation, including on how key design and management features of MPAs can influence their contribution to adaptation.

In order to address these questions, the factors that the literature considered as key for ecological and social adaptation were identified (hereafter "adaptation pathways", see Figure 1). The effect of MPAs on each of these adaptation pathways was then quantified.

- 1 Jacquemont, J., Blasiak, R., Le Cam, C., Le Gouvellec, M., Claudet, J. (2022). Ocean conservation boosts climate change mitigation and adaptation. *One Earth* 5: 1126-1138. <https://doi.org/10.1016/j.oneear.2022.09.002>
- 2 Rankovic, A., Jacquemont, J., Claudet, J., Lecerf, M., Picourt, L. (2021). Protecting the ocean, mitigating climate change? State of the evidence and policy recommendations. Ocean & Climate Platform Policy Brief. Available [here](#).
- 3 Pörtner, H.-O., Roberts, D.C., et al. (2022). Climate Change 2022. Impacts, Adaptation and Vulnerability. Summary for Policymakers of Working Group II contribution to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. 27th February 2022. Available [here](#).

ECOLOGICAL ADAPTATION



PHENOTYPIC PLASTICITY

capacity to acclimatate



CONNECTIVITY

spatial connectivity



STABILITY

temporal stability



BIODIVERSITY

species richness & shannon index



GENETIC DIVERSITY

allelic richness



BODY CONDITION

health



REPRODUCTION

reproductive output & recruitment



COASTAL PROTECTION

sediment accretion & wave attenuation

SOCIAL ADAPTATION



ASSETS

income & costs



FLEXIBILITY

occupational diversity



SOCIAL ORGANIZATION

conflict & cohesion



LEARNING

environmental awareness & education



AGENCY

user rights & participation



FOOD SECURITY

CPUE & local nutrition

Figure 1. The fourteen assessed ecological and social pathways that contribute to climate change adaptation.

The contribution of MPAs to ecological adaptation

The review found that in comparison to unprotected sites, MPAs contribute to ecological adaptation by increasing **biodiversity, reproductive output** and **coastal protection**.

- Increased species richness provides a higher level of “insurance” for an ecosystem to adapt to changing conditions. Indeed, even if climate change strongly impacts (or drives extinct) some species, having more species in the ecosystem increases the odds that the ecosystem will keep functioning nonetheless. The review found that species richness (e.g., the number of species) was higher in MPAs than in unprotected sites.
- Reproductive output refers to the capacity of organisms to multiply (e.g., number of eggs and larvae). It is key for adaptation because it contributes to the capacity of populations to recover from climatic stressors. MPAs were found to have a strong positive effect on the reproductive output of marine organisms, likely because of larger, older and more abundant individuals in MPAs, leading to an increased production of offspring.
- Coastal protection is an ecosystem service provided by coastal ecosystems, such as mangroves, tidal marshes, coral reefs and seagrass. The literature synthesis found that, when compared to degraded habitats, well-preserved mangroves and tidal marshes enhanced coastal protection through higher rates of soil accretion (e.g., the building and stabilization of soil on the coast). Coral reefs and seagrass can also contribute to coastal protection through wave attenuation, but no study has assessed whether conservation can enhance wave attenuation. However, it is likely that protected habitats would perform better than degraded habitats.

The remaining pathways contributing to ecological adaptation were either not affected by MPAs or lacked data to assess MPAs’ effect. In particular, the ability of MPAs to enhance connectivity constitutes a major knowledge gap, as connectivity is one of the most important pathways for adaptation to climate change, because it allows recolonization of disturbed habitats, gene exchanges, and climatic migrations.

The contribution of MPAs to social adaptation

Regarding social adaptation pathways, MPAs were found to have a majority of positive outcomes (i.e., five out of the six investigated pathways). The review notably found positive effects of MPAs to adaptation through **food security, assets, environmental awareness, participation, and alternative livelihoods**.

- MPAs were found to significantly increase food security, measured using catch per unit effort (CPUE). This is due to the replenishing of fish populations in MPAs, which can subsequently spill over into fishing grounds, thus benefiting local fisheries. It is worth noting that the review only observed increases in CPUE when the MPA included, or was, a fully protected area, i.e., a protected area where no fishing is allowed.
- This result is further backed-up by the observed increase in fishers’ income in the presence of a fully protected area. Increases in CPUE and income of some fishers support the debated fact that MPAs can enhance the livelihood of fishers, which in turn contributes to building social adaptive capacity to climate change through increased food security and assets.
- The other most positive social adaptive outcomes of MPAs were increases in environmental awareness (95% of cases), participation (57% of cases), and alternative livelihoods (48% of cases).

The review, however, found **negative effects of MPAs on social organization (through increased conflicts) as well as on some aspects of agency (through decreased user-rights) and of assets (through increased fishing costs)**. In 65% of cases, user-rights were negatively affected by access and extraction restrictions imposed by MPAs, hence reducing local people’s agency. Increases in conflicts (59% of cases) arose from changes in the spatial use of marine areas, potentially leading to tensions with different sectors, in particular tourism and fisheries. But MPAs were also found to increase social cohesion (56% of cases), likely arising from cases where the MPA was established through a shared conservation vision and shared sense of purpose between stakeholders around the MPA project.

The fact that MPAs can produce such contrasting effects on social adaptation depending on their protection level and their governance, calls for greater attention on the processes chosen to design and implement them. We recommend that managers prioritize collaborative processes that give space, voice and leadership to local communities in order to value traditional knowledge, limit negative social outcomes and ultimately ensure that the MPA will be successfully implemented and contribute to both ecological and social adaptation to climate change.

2 MPA PROTECTION LEVEL, SIZE AND AGE MATTER FOR CLIMATE ADAPTATION BENEFITS

The “how” might be as or more important than the “how much”

In global policy circles, and at national levels too, quantitative goals have been set or are under discussion to further expand protected areas on land and in the ocean. One unintended perverse effect of such global area-based conservation targets is the race to designate protected areas, even in places with relatively low significance for biodiversity and climate, or with weak protection levels or a weak implementation^{4,5}.

The literature review further stresses that the ability of MPAs to provide climate benefits depends on characteristics such as protection level and age. For the three adaptation pathways for which sufficient data was available (biodiversity, CPUE and income), the review identified three recurring features of MPAs that conditioned their contribution to climate change adaptation:

- **Across all three pathways, adaptation benefits can arise from fully or highly protected areas (but only in the presence of a fully protected area for the later).** In contrast, lower levels of protection generated no benefits. Furthermore, increases in biodiversity and in fishers’ income only occurred for fully protected areas, where no

fishing is allowed. Increases in CPUE could also be achieved by highly protected areas, where low-impact fishing is allowed, but only if a fully protected area was also present in the MPA considered. It must also be noted that this result was found for carbon sequestration as well.

- **All three adaptation pathways were positively correlated with MPA age.** This is explained by the time required for exploited fish stocks to rebuild and subsequently benefit adjacent fisheries. Ensuring that MPAs will remain in place and be managed over several decades is thus key. This result was found for carbon sequestration as well.
- **CPUE was positively correlated with MPA size,** which can result from a greater proportion of mobile fish having their home ranges included in the MPA.

The level of protection, age and size have already been established as important drivers and enabling conditions for MPAs to deliver ecological benefits. The review results show that this is also the case for climate mitigation and adaptation benefits.

Inclusivity, rights and justice as social adaptation

However, as noted above, the review also found that in some cases MPAs could have negative impacts on social organization. This suggests that how MPAs are governed is a fundamental factor in determining whether MPAs will enhance or impede social adaptation. Several studies have evidenced that an MPA management that is more inclusive of local communities tends to generate more benefits to local stakeholders and reduce conflicts (see the full review for references). The support of local stakeholders is an enabling condition of effective MPAs.

The role of Indigenous Peoples and Local Communities (IPLCs) in the management of MPAs remains however understudied in the literature⁶. Their local

4 Visconti, P., Butchart, S. H., Brooks, T. M., Langhammer, P. F., Marnewick, D., Vergara, S., ... & Watson, J. E. (2019). Protected area targets post-2020. *Science*, 364(6437), 239-241.

5 Claudet, J., Loiseau, C., and Pebayle, A. (2021). Critical gaps in the protection of the second largest exclusive economic zone in the world. *Marine Policy* 124, 104379.

6 Ban, N. C. & Frid, A. (2018). Indigenous peoples’ rights and marine protected areas. *Marine Policy* 87, 180–185.

leadership on biodiversity and climate action is well established on land^{7,8}, and the intimate connection between biodiversity conservation and Indigenous rights is increasingly recognized⁹. How their leadership can be more supported, with their free, prior, and informed consent, in the establishment and management of MPAs, should be further explored with IPLCs in both scientific and policy circles.

3 ACTION POINTS FOR UNFCCC COP27 AND BEYOND

The climate benefits of marine biodiversity conservation are increasingly recognized by policy circles, for both mitigation and adaptation. A number of state-led initiatives and coalitions from civil society organisations, UN agencies and intergovernmental organisations emerged in recent years to voice the important role of the ocean in regulating the global climate system, and advocate for its inclusion in climate negotiations.

During UNFCCC COP26 in Glasgow, Parties recognized “the importance of protecting, conserving and restoring ecosystems to deliver crucial services, including acting as net carbon sinks, reducing vulnerability to climate change impacts and supporting sustainable livelihoods, including for indigenous peoples and local communities” (Decision 1/CP.26, paragraph 50).

COP26 also welcomed the proposal to establish an annual dialogue on ocean and climate change under the UNFCCC SBSTA to consider how to strengthen ocean-based action on climate change (Decision 1/CP.26, paragraph 58). Held in June 2022 in Bonn, the first dialogue showcased the wide-range of existing ocean-based climate solutions and opportunities to accelerate them¹⁰.

The scientific review summarized in this brief clearly demonstrates that MPAs can contribute to both mitigation and adaptation. COP27 has implementation at its heart, and this evidence shows that now is the time to accelerate action and better leverage the potential of MPAs in climate change adaptation strategies (with co-benefits for mitigation).

To that end, in Sharm El-Sheikh, it is imperative to:

■ **Further include MPAs throughout on-going processes on adaptation at the UNFCCC.** There are numerous opportunities to include MPAs in current UNFCCC processes related to adaptation¹¹, and delegates should notably act on the following points:

- + Ensure MPAs are addressed in the workshops under the **Glasgow-Sharm El-Sheikh Work Programme on the Global Goal on Adaptation** (GGA) that is being carried out jointly by the SBSTA and SBI.
- + Invite the **Nairobi Work Programme (NWP) Thematic Expert Group on the Ocean and Coastal Zones** to further provide tools and guidance on how to ensure the integration of MPAs in adaptation strategies, especially for Least Developed Countries (LDCs)¹².
- + Invite the **Adaptation Committee** (AC) to work in collaboration with the NWP's Thematic Expert Group on the Ocean and Coastal Zones to utilize its technical expertise by developing briefs on MPAs. Also suggest the Adaptation Committee to include MPAs in the work of its National Adaptation Plans (NAP) task force.

7 Dinerstein, E. et al. (2020). A “Global Safety Net” to reverse biodiversity loss and stabilize Earth’s climate. *Science Advances* 6, eabb2824.

8 See, for instance: Biodiversity and climate crisis - the pivotal role of local communities and Indigenous Peoples, on [World Bank Blogs](#).

9 Ellis, E. C., Gauthier, N., Goldewijk, K. K., Bird, R. B., Boivin, N., Díaz, S., ... & Watson, J. E. (2021). People have shaped most of terrestrial nature for at least 12,000 years. *Proceedings of the National Academy of Sciences*, 118(17).

10 See the [UNFCCC page](#) on the dialogue, and the report of the dialogue [here](#).

11 See “Options for strengthening action on the ocean and coasts under the UNFCCC”, October 2022, available [here](#).

12 Learn more on this [UNFCCC page](#).

- + The **Global Stocktake** will be a key moment to assess and increase ambition, and MPAs should be more considered as part of adaptation strategies¹³.
- **Include MPAs as part of National Adaptation Plans (NAPs) and Nationally Determined Contributions (NDCs)**¹⁴. As of May 2022, only 35% of coastal and island nations included MPAs in their updated NDCs¹⁵. In line with the ambition loop, there is significant room for progress for Parties to include MPAs in their updated national strategies at COP27 and beyond.
- **Consider MPAs as ecosystem-based options for the adaptation of coastal cities**. As they concentrate a major and growing share of the world population, coastal cities are hotspots of climate vulnerability and should receive greater financing for adaptation, especially in developing countries. MPAs should be part of the ecosystem-based approaches to adaptation that they could implement¹⁶.
- **Increase the share of finance dedicated to MPAs for climate benefits**. MPAs should receive more funding as part of ocean-based mitigation and adaptation strategies¹⁷, with equitable access to resources. Notably, direct access to funding for IPLCs should be strongly increased to support their leadership in MPAs and more generally in marine conservation and sustainable use¹⁸. The countries most vulnerable to climate change also suffer from debt burden, and if instruments such as debt-for-climate swaps are developed¹⁹, MPAs should be considered as part of adaptation measures during negotiations on debt restructuring.
- **No Paris without Montreal**. Finally, it must be recalled that COP27 takes place only a few weeks before COP15 (7-19 December, Montreal) of the Convention on Biological Diversity (CBD). Acting strongly in favor of marine and terrestrial biodiversity is sine qua non in order to achieve the goals of the Paris Agreement²⁰: there will be no Paris without Montreal, and Sharm El-Sheikh must send this message loud and clear. **Parties should call for an ambitious outcome of COP15 in CP and CMA cover decisions, as key to achieving the goals of the UNFCCC on both mitigation and adaptation.** ■

13 See Schindler Murray, L., Romero, V. and Herr, D. (2021): Unpacking the UNFCCC Global Stocktake for Ocean-Climate Action. IUCN, Rare, Conservation International, WWF, and Ocean & Climate Platform. Available [here](#).

14 While NDCs shall embody national efforts to reduce greenhouse gas emissions, article 7.11 of the Paris Agreement establishes that adaptation communication can be submitted as a component of or in conjunction with other documents, including NDCs.

15 Lecerf, M., Herr D., Thomas, T., Elverum, C., Delrieu, E. and Picourt, L., (2021), Coastal and marine ecosystems as Nature-based Solutions in new or updated Nationally Determined Contributions, Ocean & Climate Platform, Conservation International, IUCN, GIZ, Rare, The Nature Conservancy, Wetlands International and WWF. Available [here](#).

16 Bongarts Lebbe, T., Beguin Billecocq, I., Vegh, T., & Sarkozy-Banoczy, S. (2022) Investment Protocol: Unlocking Financial Flows for Coastal Cities Adaptation to Climate Change and Resilience Building. Blue-tinted white paper. Race to Resilience, High-Level Climate Champions. Available [here](#).

17 See the Ocean for Climate Declaration, [here](#).

18 Hatcher, J., Owen, M., Yin, D. (2021). Falling Short. Donor funding for Indigenous Peoples and local communities to secure tenure rights and manage forests in tropical countries (2011–2020). Rainforest Foundation Norway.

19 See the V20 Ministerial Communique published on 16 October 2022, [here](#).

20 Picourt, L., Lecerf, M., Goyet, S., Gaill, F., Cuvelier, R. & Parmentier, R. (2021), Swimming the talk: How to strengthen collaboration and synergies between the Climate and Biodiversity Conventions? Ocean & Climate Platform Policy Brief. Available [here](#).

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